Drone Advisory Committee

Public eBook

Public eBook
June 23, 2021 DAC Meeting • Virtual

Drone Advisory Committee

June 23, 2021 DAC Meeting • Virtual Meeting

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Virtual Meeting Logistics

- We ask that everyone remain muted during the presentations. After each briefing, there will be an opportunity for the DAC members to engage in discussion and ask questions.
- Because of the large size of the group we ask that you first raise your hand using the Zoom command on your dashboard. An FAA moderator will be monitoring the dashboard and call on you to begin speaking.
- This DAC meeting is being livestreamed and recorded. It will be made available for future viewing on the FAA's YouTube channel.
- This is a public meeting and there may be members of the media viewing the livestream. They will be instructed that all discussions are for background only.
- To access the livestream links, go to either of these websites: https://www.facebook.com/FAA or https://www.youtube.com/FAAnews

Confirmed FAA/DOT Attendees (on camera)

Name	Title	Org.
1. Jay Merkle	Executive Director, UAS Integration Office	FAA
2. Bradley Mims	Deputy Administrator	FAA
3. Laurence Wildgoose	Assistant Administrator, Office of Policy, International Affairs and Environment	FAA
4. Ali Bahrami	Associate Administrator, Aviation Safety	FAA
5. Teri Bristol	Chief Operating Officer, Air Traffic Organization	FAA
6. Timothy Arel	Deputy Chief Operating Officer, Air Traffic Organization	FAA
7. Mark Bury	Acting Chief Counsel, Office of General Counsel	FAA
8. Shannetta Griffin	Associate Administrator, Airports	FAA
9. Claudio Manno	Associate Administrator for Security and Hazardous Materials Safety	FAA
10. Matthew Lehner	Assistant Administrator, Office of Communications	FAA
11. Bill Crozier	Deputy Executive Director, UAS Integration Office	FAA
12. Gary Kolb	UAS Stakeholder & Committee Officer, UAS Integration Office	FAA

Confirmed FAA/DOT Observers

Name	Title	Org.
1. Erik Amend	Manager, Executive Office, UAS Integration Office	FAA
2. Chris Rocheleau	Deputy Associate Administrator, Aviation Safety	FAA
3. Tonya Coultas	Deputy Associate Administrator, Security and Hazardous Materials Safety	FAA
4. Jeannie Shiffer	Deputy Assistant Administrator, Office of Communications	FAA
5. Leesa Papier	Director, Office National Security Programs and Incident Response	FAA
6. Adrienne Vanek	Director, International Division, UAS Integration Office	FAA
7. Joe Morra	Director, Safety and Integration Division, UAS Integration Office	FAA
8. Martha Christie	Deputy Director, Safety & Integration Division, UAS Integration Office	FAA
9. Emmanuel Cruz	Manager, Implementation Branch, UAS Integration Office	FAA
10. Elizabeth Forro	Special Assistant, UAS Integration Office	FAA
11. Genevieve Sapir	Security Programs Advisor, Security and Hazardous Materials Safety	FAA
12. Allison LePage	Digital Communications Manager, Office of Communications	FAA
13. Jessica Orquina	Lead Communications Specialist, UAS Integration Office	FAA

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Public Meeting Agenda
Time: 12:00 pm. to 2:30 p.m. Eastern Time
Location: Virtual Video Conference

	Start	Stop	
1.	12:00 pm	12:05 pm	**FAA – Greetings & Logistics**
2.	12:05 pm	12:10 pm	**DFO – Read Official Statement of the Designated Federal Officer**
3.	12:10 pm	12:15 pm	**DFO – Review of Agenda and Approval of Previous Meeting Minutes**
4.	12:15 pm	12:20 pm	**DFO – Opening Remarks**
5.	12:20 pm	12:25 pm	**Acting Chair – Opening Remarks**
6.	12:25 pm	12:55 pm	**Acting Chair – Task Group 9 Recommendations – Report on Situational Awareness**
7.	12:55 pm	1:25 pm	**DFO – UAST Presentation**
8.	1:25 pm	1:35 pm	**BREAK**
9.	1:35 pm	2:05 pm	**Acting Chair – Operations and Technology Subcommittee, Task Group 10 - Gender Neutral Language for the Drone Community Recommendations**
10.	2:05 pm	2:15 pm	**DFO – New Taskings**
11.	2:15 pm	2:25 pm	**Acting Chair – New Business/Future Agenda Topics**
12.	2:25 pm	2:28 pm	**DFO – Closing Remarks/Final Thoughts**
13.	2:28 pm	2:30 pm	**Acting Chair – Closing Remarks/Final Thoughts**
14.	2:30 pm	2:30 pm	**Acting Chair – Adjourn**

Questions/Comments: Contact Gary Kolb, UAS Stakeholder & Committee Officer (gary.kolb@faa.gov or 202-267-4441).

Drone Advisory Committee

DAC Membership – As of 6/7/2021

Stakeholder Group	Members
Designated Federal Officer	**Jay Merkle**, Executive Director, UAS Integration Office, Federal Aviation Administration
Acting Chair	**Houston Mills**, Vice President, Flight Operations and Safety, United Parcel Service (UPS)
Airports and Airport Communities	**Seleta Reynolds**, General Manager, Los Angeles Department of Transportation **Dr. Paul Hsu**, Founder and Chair, HSU Educational Foundation
Labor (controllers, pilots)	**Trish Gilbert**, Executive Vice President, National Air Traffic Controllers Association (NATCA) **Joseph DePete**, President, Air Line Pilots Association (ALPA)
Local, State, Tribal and/or Territorial Government or Appropriate International Entity	**David Greene**, Bureau of Aeronautics Director, Wisconsin Department of Transportation **Bob Brock**, Director of Aviation and UAS, Kansas Department of Transportation **Mark Colborn,** Senior Corporal, Dallas Police Department **Michael Leo**, Captain, New York City Fire Department
Navigation, Communication, Surveillance, and Air Traffic Management Capability Providers	**Mariah Scott**, President, Skyward (a Verizon company) **Matt Parker**, President, Precision Integrated Programs
Research, Development, and Academia	**Robie Samanta Roy**, Vice President, Technology, Government Affairs, Lockheed Martin Corporation
Traditional Manned Aviation Operators	**Mark Baker**, President and Chief Executive Officer, Aircraft Owners and Pilots Association **Lorne Cass**, President**,** Aero NowGen Solutions, LLC **Molly Wilkinson**, Vice President, Regulatory Affairs, American Airlines
UAS Hardware Component Manufacturers	**Brad Hayden**, Founder and Chief Executive Officer, Robotic Skies **Christian Ramsey**, President, uAvionix Corporation
UAS Manufacturers	**James Burgess**, Chief Executive Officer, Wing (an Alphabet company) **Michael Sinnett**, Vice President Product Development and Strategy, Boeing Commercial Airplanes **David Carbon**, Vice President, General Manger, Amazon Prime Air **Adam Bry**, Co-founder and Chief Executive Officer, Skydio
Corporate UAS Operators	**Greg Agvent**, Senior Director of National News Technology, CNN **Todd Graetz**, Director, Technology Services, UAS Program, BNSF Railway
Citizen UAS Operators	**Kenji Sugahara**, Chief Executive Officer and President, Drone Service Providers Alliance **Vic Moss**, Owner, Moss Photography
UAS Software Application Manufacturers	**Jaz Banga**, Co-Founder and Chief Executive Officer, Airspace Systems, Inc. **Chris Anderson**, Chief Executive Officer, 3DR

Stakeholder Group	Members
Agricultural Interests	**Brandon Torres Declet**, Chief Executive Officer and Co-Founder, MEASURE and Chief Operating Officer & Board Director, AgEagle
Advanced Air Mobility	**Dr. Jaiwon Shin**, Executive Vice President, Head of Urban Air Mobility (UAM) Division and Chief Executive Officer, Genesis Air Mobility, Hyundai Motor Group **Dr. Catherine Cahill**, Director, Alaska Center for Unmanned Aircraft Systems Integration (ACUASI)
Industry Associations or other specific areas of interest as determined by the DAC DFO	**Brian Wynne**, President and Chief Executive Officer, Association for Unmanned Vehicle Systems International **Thomas Karol**, General Counsel, National Association of Mutual Insurance Companies **David Silver**, Vice President for Civil Aviation, Aerospace Industries Association **Lee Moak**, Founder & Chief Executive Officer, The Moak Group

Drone Advisory Committee

Task Group 9 Report on Situational Awareness

June 23, 2021
James Ryan Burgess
Task Group 9 Chair

Task Group 9 Report on Situational Awareness

Tasking

The Federal Aviation Administration's (FAA) Drone Advisory Committee initiated a new tasking in its October 22, 2020 meeting to explore ways to increase situational awareness in low altitude airspace, to include the use of remote identification information.

The tasking, formalized as Task Group 9, was charged with expanding on an earlier FAA Request for Information (RFI): FAA Low Altitude Manned Aviator Participation In UAS Remote Identification Request for Information. Specifically:

> DAC to engage operators in low altitude airspace to obtain feedback on how remote identification might be used to increase situational awareness and use this feedback to develop recommendations on how the FAA can address responses to the RFI.

The FAA originally received 30 total responses reporting "dubious benefits". The FAA cited concerns relating to UAS responsibilities in the airspace, remote identification being security-focused (instead of safety-focused), and associated human factors implications. Task Group 9 was established to broaden the number and representation of respondents to the FAA's inquiry.

Approach

Task Group 9 elected to examine the FAA's tasking in two parts: 1) to answer the specific question posed by the FAA and, 2) to explore the spirit of the question. Following agreement to this approach, the Task Group sub-divided efforts into three work streams.

Sub-Group 1. The FAA's RFI looked to explore how operators in low altitude airspace can voluntarily interact with remote identification information. Sub-Group 1 was formed to ask if and how remote identification could be used to increase situational awareness between piloted aircraft and UAS. This group kept a strict adherence to the letter of the tasking and avoided technology-specific debates.

The FAA was unable to provide responses to the RFI, but was able to share the names of the 30 respondents. The group attempted to contact each of the respondents to learn about their motivation and rationale for responding to the FAA's request and successfully reached 21 of the authors. Sub-Group 1 then designed two surveys that built upon the themes identified in the RFI responses and conversations with subject matter experts. One survey was directed toward the piloted aircraft community and a second survey reached out to the UAS community with results collected until the end of April. Survey results will be discussed below and are included in Annex 1.

Sub-Group 2. The National Airspace System (NAS) features a host of technologies that can distribute situational awareness information to airspace users. Many of these technologies are required and some are supplemental. Legacy onboard technologies often have associated standards and training while new capabilities are solving for pilot needs in new and innovative ways. Sub-Group 2 studied existing and developing technologies that can convey situational awareness information pertaining to UAS - including remote identification.

Sub-Group 2 performed a thorough review of technologies able to convey situational awareness information in low altitude airspace. This group was encouraged to consider methods for sharing remote identification, as well as other situational awareness data. The group also evaluated capabilities which could surface piloted aircraft information to the UAS ecosystem and capabilities that could be bi-directional.

Sub-Group 3. Considering the different technologies and policies that relate to situational awareness in the NAS, it was important to understand how UAS use cases align with existing solutions and those that are in development. Sub-Group 3 analyzed ways to maximize the effectiveness of capabilities available to piloted aircraft and UAS to drive situational awareness while avoiding mandates on operators in low altitude airspace.

The FAA's UTM Concept of Operations Version 2.0 outlines the government's intent to integrate UAS with piloted aircraft in low altitude airspace through the use of UAS Traffic Management (UTM) services. Sub-Group 3 relied upon this document as a framework to discuss incremental improvements and policy changes that support greater situational awareness by use of UTM. The group discussed near-term solutions that can be recognized immediately and longer-term solutions that become apparent with the maturation of UTM capability.

Findings

The objectives of Task Group 9 were to learn whether remote identification can serve as an informational bridge among operators in low altitude airspace, as well as to engage with the piloted aircraft and UAS communities to better understand how to increase situational awareness as UAS are integrated.

Given the FAA's traditional RFI process yielded a limited array of responses, the Drone Advisory Committee (DAC) was a logical home for increased outreach due to the fact that the UAS industry has focused on the merits of remote identification technologies dating back to the UAS Identification and Tracking Aviation Rulemaking Committee four years ago.

By the numbers, Task Group 9 achieved a significant increase in the number of stakeholders participating in this discussion. The group featured representatives from 36 organizations meeting regularly for seven months. Input to Sub-Group 1's surveys totaled well over 300 unique responses.

Bringing the experience of the DAC membership and other interested parties to this conversation, Task Group 9 was able to identify baseline assumptions with respect to the use of remote identification by piloted aircraft. For instance, international standards for remote identification are designed to meet security requirements as opposed to safety needs. Therefore, Task Group 9 recognizes that remote identification information should be used for situational awareness purposes only. The group also insists that all equipage or policy considerations be completely voluntary for the piloted aircraft community.

Setting these guideposts allowed patterns to emerge from the three Sub-Groups. Feedback from the surveys created in Sub-Group 1 indicate that the piloted aircraft community is interested in having access to remote identification information, especially if it is able to be filtered for environments where UAS are most likely to be present. Paired with findings in Sub-Group 2, it became clear that remote identification and other situational awareness data are available to piloted aircraft through existing onboard equipment such as electronic flight bags (EFBs) or other handheld devices.

Additionally, there are several widely used technologies in the NAS that can convey situational awareness information to the UAS ecosystem. The technology matrix created by Sub-Group 2 breaks down technology solutions into two categories: those that allow piloted aircraft to become aware of nearby UAS and those that allow UAS to become aware of nearby piloted aircraft. Though the Sub-Group was successful in identifying these technologies, quantifying their costs (e.g., installation, subscription, supporting equipment, and shared purpose) proved to be challenging. The matrix is included in Annex 2 and provides cost ranges for each of the technology solutions enumerated.

Sub-Group 3 took a closer look at those technology solutions that are available, but may not have been adapted for use with the growing UAS industry. It was determined that existing broadcast requirements for piloted aircraft in most controlled airspace could also serve valuable to equipped UAS. Similarly, air traffic radio communications could be monitored by UAS Operators to gain awareness of cooperative air traffic in their proximity. The group also developed approaches for UTM services such as flight planning and network identification to improve situational awareness and UAS integration efforts.

The Task Group reached out to subject matter experts to better understand the state of the art for situational awareness solutions and practices including air traffic control, academia, standards development organizations, and aviation instrument manufacturers. The group also studied foreign efforts to increase situational awareness in the airspace systems of other continents.

Promulgation of the FAA's Remote Identification of Unmanned Aircraft rulemaking in the midst of Task Group 9's efforts shifted conversations regarding the accessibility of remote identification by network means. Several of the original responses to the FAA's RFI focused primarily on network identification use cases; and a number of responses to the UAS community survey expressed support for the availability of remote identification information by network means. Ultimately, Task Group 9 concludes that network remote identification remains a voluntary option for situational awareness among piloted aircraft, although awareness is likely to be lower and it may not be as prevalent since it was not recognized by the FAA as an explicit Means of Compliance for remote identification requirements.

Each of the Sub-Groups has submitted reports detailing their activities supporting Task Group 9: these reports can be found in Annexes 1-3. Recommendations and questions specific to the Sub-Groups can be found with the reports.

Recommendations

Task Group 9 has found widespread interest among operators in low altitude airspace to identify pathways for increased situational awareness among piloted aircraft and UAS. Based on the investigation of the Sub-Groups, there are a number of solutions available to these users today and may require only small updates to accessibility or policy. Remote identification presents an opportunity for piloted aircraft to learn when UAS may be operating in the airspace around them.

Demonstrations in the United States and abroad have proven the viability of certain piloted aircraft technologies to be leveraged by the UAS community, and vice versa. For example, UAS Operators are exploring the value of ADS-B In technologies to gain awareness of nearby piloted aircraft.

The FAA and partner agencies should continue to work with industry to build a more integrated NAS. Efforts such as National Aeronautics and Space Administration's (NASA) UTM Pilot Programs are effective methods for researching, testing, and validating techniques which can improve situational awareness. Remote identification was recently trialed by the FAA and NASA in UTM Pilot Program 2 illustrating (among other things) the ability to be viewed by common handheld devices such as a tablet.

As remote identification information becomes available via UTM, it will be a useful tool in an arsenal of information sharing that connects UAS to other UAS and UAS to the broader airspace community. The FAA should ensure that the implementation of remote identification does not foreclose future opportunities to access basic remote identification information, although it should not be misconstrued or relied upon as means of separation.

The Sub-Group reports offer strong recommendations and raise important questions for the FAA to consider as it continues building its integration strategy. They are the result of thoughtful and careful deliberation about the needs of all operators in low altitude airspace, as well as other relevant stakeholders. In support of the Sub-Group recommendations, Task Group 9 offers the following high-level observations:

1. The FAA should avoid technology-specific recommendations related to the use of remote identification, but instead emphasize the accessibility of publicly available remote identification information.
2. Any updates to piloted aircraft practices and procedures should be voluntary and, when possible, should conform with existing electronic flight bag or onboard display technologies. Additionally, human-factors considerations should be investigated before promoting remote identification information to onboard piloted aircraft equipment.
3. The UAS industry (partnering with the FAA and piloted aircraft community) should develop integration strategies that foster maximum awareness in low altitude airspace, and create avenues for piloted aircraft to access information regarding UAS operations.
4. The FAA should review existing policies related to piloted aircraft technologies to assess their adaptability to UAS use cases. For instance, emphasis and encouragement should be placed where UAS and piloted aircraft integration efforts are already underway. Where possible, the FAA and industry should rely upon already-existing technology (such as ADS-B).

Acknowledgment

A very heartfelt thank you goes out to Chris Cooper, Chad Budreau, Jennifer Player, Jarrod Knowlden, Mark Colborn, and Sam Ewen for volunteering their time and leadership across Task Group 9's three Sub-Groups. This report and our contributions to the DAC are not possible without their commitment.

Along with the Sub-Group leadership, we would also like to thank all the participants who contributed to this project. This report is further made possible by the following individuals and the support of their respective employers or organizations:

Academy of Model Aeronautics, Chad Budreau
Academy of Model Aeronautics, Tyler Dobbs
Academy of Model Aeronautics, Rich Hanson

Aero NowGen Solutions, Lorne Cass

Aerospace Industries Association, Karina Perez

Air Line Pilots Association, International, Bryan Lesko
Air Line Pilots Association, International, Vaslav Patterson
Air Line Pilots Association, International, Mark Reed

Aircraft Owners and Pilots Association, Chris Cooper

Airspace Systems, Jaz Banga

American Association of Airport Executives, Justin Barkowski

Ariascend, Kenji Sugahara

Association for Unmanned Vehicle Systems International, Michael Robbins
Association for Unmanned Vehicle Systems International, Brian Wynne

ASTM International, Philip Kenul

Aviation Management Association, Charles Keegan

BNSF, Todd Graetz
BNSF, Jennifer Player
BNSF, Catherine Self

Commercial Drone Alliance, Lisa Ellman

Dallas Police Department, Mark Colborn

DJI, Brendan Schulman

Experimental Aircraft Association, Lily Johnson

FPV Freedom Coalition, Dave Messina

Global Air Drone Academy, Alex Suarez

GOEXA, Gur Kimchi

Helicopter Association International, Chris Martino

Hyundai, Diana Marina Cooper

Joby Aviation, Max Fenkell

Kansas Department of Transportation, Bob Brock

National Agricultural Aviation Association, Brian Rau

National Air Traffic Controllers Association , Trish Gilbert
National Air Traffic Controllers Association , Jimmy Smith

National Association of Mutual Insurance Companies, Thomas Karol

Onesky, Chris Kucera

Precision Hawk, Michael Chasen

Skyward, Sam Ewen
Skyward, Mariah Scott

Small UAV Coalition, Greg Walden

State Farm, Ryan Gammelgard

uAvionix, Christian Ramsey

Uber, Greg Belaus
Uber, Danielle Rinsler

ULASS Global, Rich King

Wing, James Ryan Burgess
Wing, Margaret Nagle
Wing, Matthew Satterley

Xi Drone Systems, Dwaine Parker

ANNEX 1 - Sub-Group 1

Report

Introduction and Background

In March 2020, the FAA published a Request for Information (RFI) regarding low altitude manned aviator participation in UAS remote identification (RID). The RFI sought input from the piloted aircraft community regarding whether and/or how they can potentially receive and use UAS RID information to further enhance safety. The FAA received responses from stakeholders representing piloted aircraft and UAS operators, manufacturers, service suppliers, and governments.

Scope

In October 2020, the FAA tasked the Drone Advisory Committee to further investigate how low altitude aviators can voluntarily use UAS RID to further enhance safety. Specifically, the DAC has been tasked to engage operators in low altitude airspace to obtain feedback on how RID might be voluntarily used to increase situational awareness and to use this feedback to develop recommendations on how the FAA can address responses to the 2020 RFI.

> *Can Remote ID be used to increase situational awareness between manned aviation that routinely operates at low altitudes away from airports and UAS operating in the same airspace?*

Methodology

Sub-Group 1 was formed to specifically gather data and provide recommendations on how the FAA can address responses to the 2020 RFI. This Sub-Group consisted of representatives from: Academy of Model Aeronautics (AMA), Aero NowGen, Air Line Pilots Association (ALPA), Aircraft Owners and Pilots Association (AOPA), ASTM, BNSF Railway, Dallas Police Department, DJI, FPV Freedom Coalition, Experimental Aviation Association, Global Air Drone Academy (GADA), Helicopter Association International (HAI), Joby Aviation, National Agricultural Aviation Association (NAAA), OneSky, uAvionix, ULASS Global, and Wing.

Sub-Group 1 met virtually 17 times between December 2020 and May 2021 and took a methodical process over two stages. First, this group obtained 21 of the submitted 2020 RFIs, by asking authors to voluntarily submit their responses. Sub-Group 1 reviewed and summarized each of those RFIs to determine relevant stakeholder groups and reoccurring themes. Second, this group identified relevant stakeholders who did not submit responses to the 2020 RFI, along with discussion on the best methods to reach and collect data from those stakeholders.

To adequately respond to the tasking, the Sub-Group believed it was important to obtain data on the usefulness of voluntarily using RID by low altitude operators through surveying a broad array of UAS and piloted aviation stakeholders on its benefits, challenges, and opportunities.

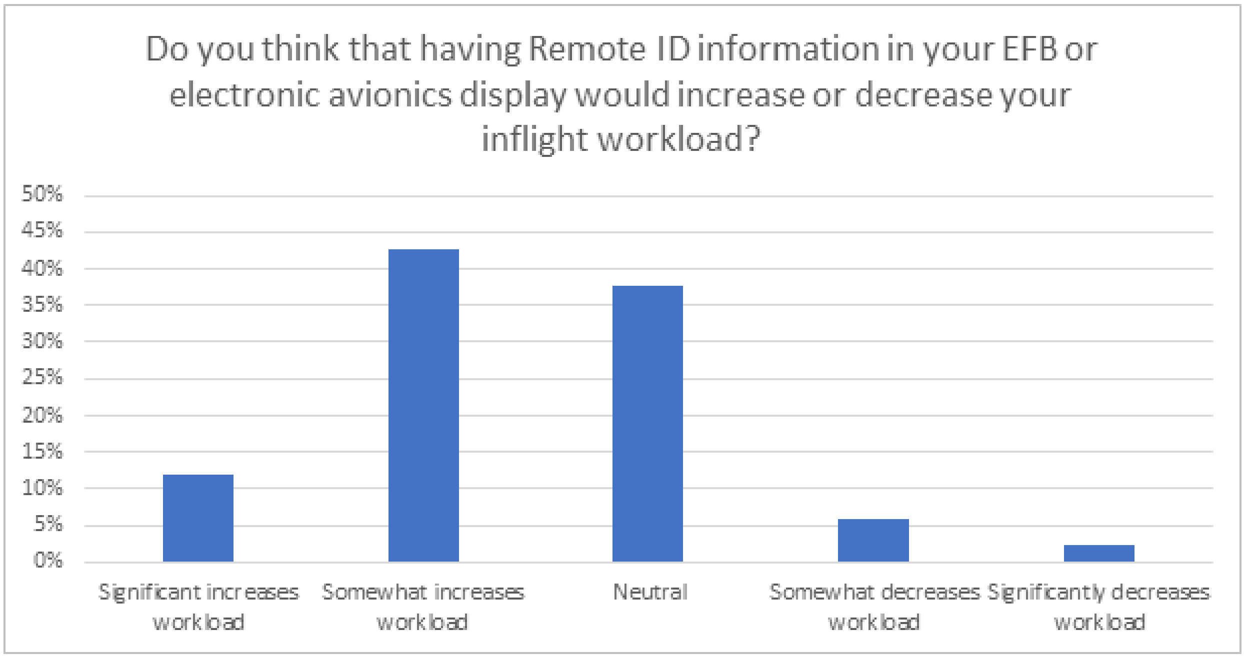
Various data collection methods and tools (such as surveys, focus groups, and interviews) were discussed with input from MITRE, AOPA, and the University of Alaska. Due to the diversity of respondents and limited time available, the Sub-Group ultimately determined two separate electronic surveys would be developed and distributed, one for the piloted aircraft and another for the UAS stakeholders. If any significant gaps in data were found, additional research methods could then be deployed.

The surveys were sent to individual contacts representing the identified stakeholders and made publicly available to the pilot communities for the month of April 2021. The raw data and findings are discussed in the following section.

Findings

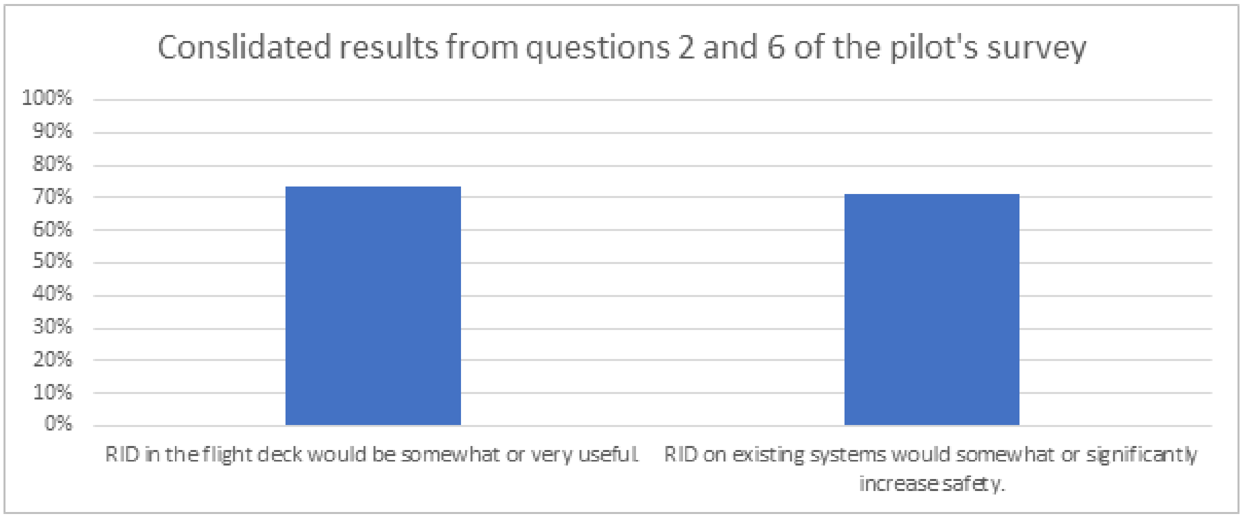
After analyzing FAA's RID and low altitude operator RFIs and using the methodology above, Sub-Group 1 created two surveys – one for pilots and a second for other stakeholders engaged in the national airspace or associated with RID. In total the group received 332 responses representing 46 different entities or organizations.

Over half of responses, 54.31%, in the pilot survey felt RID integration in the flight deck would somewhat or significantly increase workload. Many in the pilot survey expressed their concerns by commenting: "Searching takes away from situation awareness." "…we need to be teaching aviators to be looking outside and not focusing on electronics…" "More instrumentation…only increases distractions…" "Flooding our displays with targets…will be distracting and disruptive." "Too much information in the cockpit will only keep pilots' heads down more…"

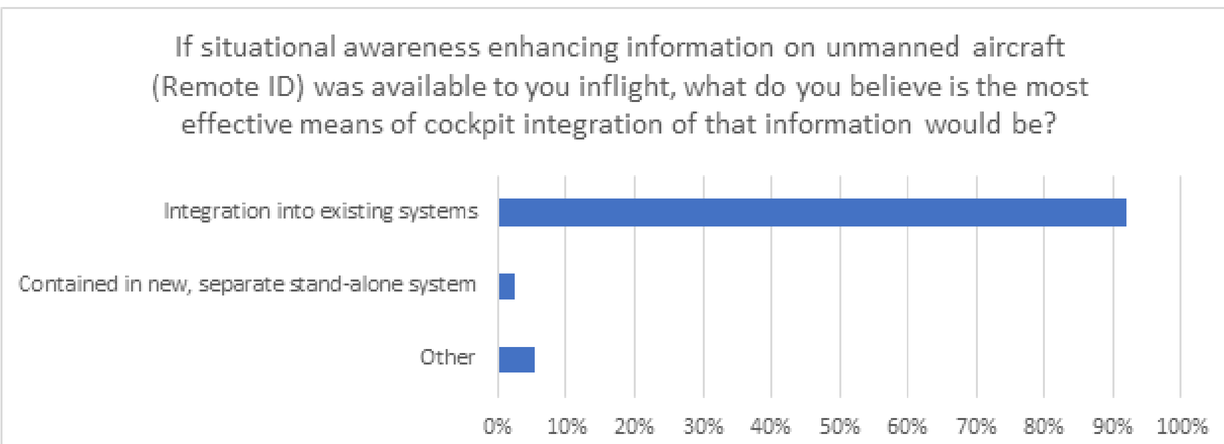


Both the stakeholder and pilot surveys reiterated that "the FAA and industry must continue to rely on the UAS operator to see/detect and avoid manned aircraft." The burden for UAS operators to detect and avoid mirrored responses Sub-Group 1 identified when reviewing the RFIs to include from one low altitude author stating "That responsibility cannot, and should never, be shifted to other airspace operators." NATCA also highlighted the fact that ATC is not allowed to use non-secure data to provide air traffic services, to include traffic advisories.

Despite concerns about workload, distractions, and the responsibility for UAS operators to avoid piloted aircraft, over 70% in the pilot survey acknowledged that RID information in existing platforms would be useful and increase safety. Some stakeholders agreed RID data could be useful with one software developer noting "with the widespread introduction of BVLOS operations, traffic management services and/or onboard technology will be relied upon to help ensure separation." This finding parallels many of the responses Sub-Group 1 identified in their review of the RFIs.

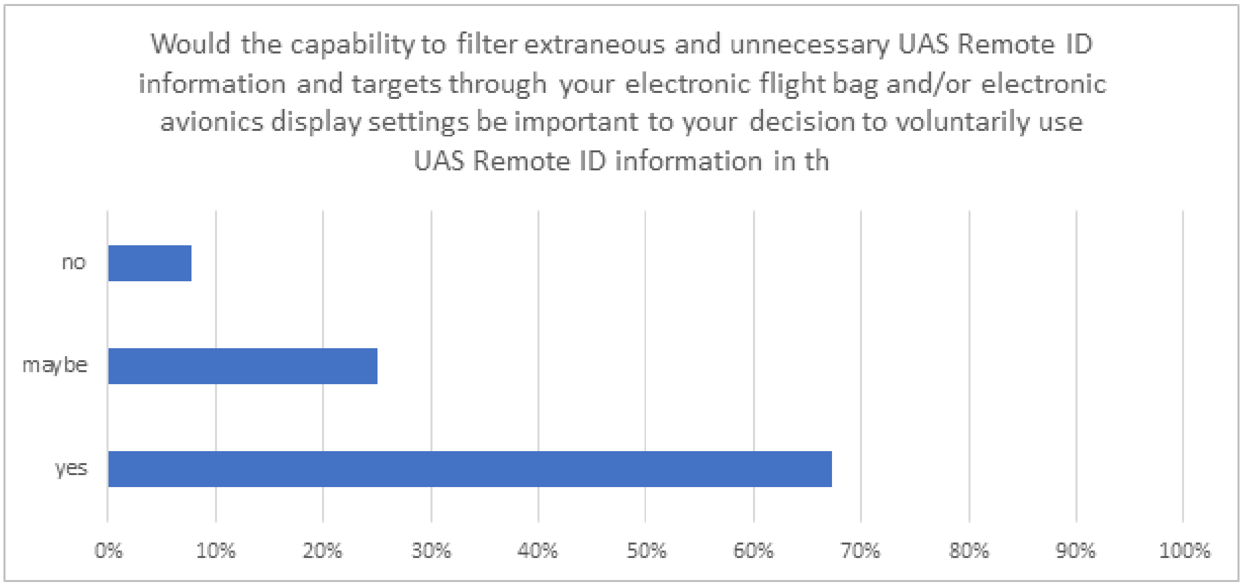


92.01% of pilots surveyed felt RID integration in the flightdeck would be most effective using existing technologies. 84.03% indicated in the survey they already use an electronic flight bag (e.g. Garmin Pilot, Foreflight), or electronic avionics display in flight. Pilots wrote comments such as "It will not be feasible to monitor another screen…"

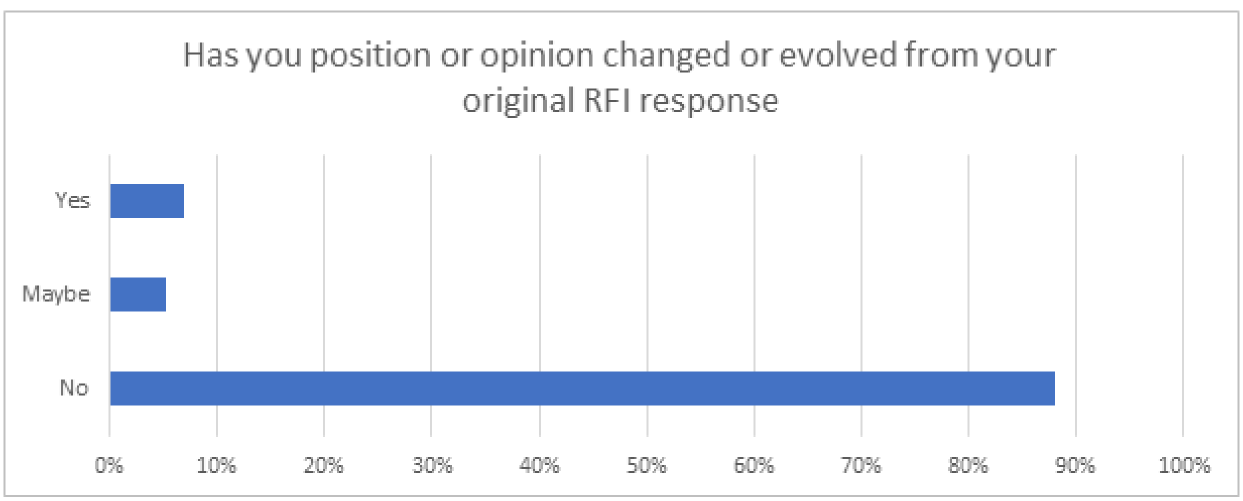


Overwhelmingly, 92.73% of pilots are interested in the capability to filter data. Open comments validated this position with statements such as "…filter this [RID] information so the amount of drones does not clog the display…" "The less clutter on the display, the better." "I don't want my screen cluttered." "Too much information can cause sensory overload." "…it will clutter the display." This finding corresponded to many of the RFI responses Sub-Group 1 identified to include one author stating, "Having a layered system of detection to eliminate clutter on the screen would be helpful once integrated."

Pilots further clarified the need to filter based on operation type or altitude. For example, some pilots felt RID data was more valuable at lower altitudes noting RID "Would be most useful if only displayed…when I am below 1000 AGL…" and "UAS information would be virtually useless in the airliner." In addition, a pilot also mentioned "I would like to know when a UAS is over 400'…"



Some who took the survey also participated in FAA's RID and low altitude RFI. 87.93% of those who participated in our surveys and responded to the RFI stated their position has not changed or evolved. Of the 12.01% who indicated their position did or maybe changed from the RFI, the majority responded that they now believe RID "on EFB would be a useful tool." One software developer who indicated their position changed stated, "We were writing from the perspective of an NPRM…"



Responses to the UAS stakeholder industry survey focused the representation and availability of RID information to piloted aircraft and other users of low altitude airspace. Some of these responses align with feedback received from the piloted aircraft and user survey, including the need to develop appropriate methods or techniques to filter RID information in ways that will maximize situational awareness without inundating operators in low altitude airspace with data (e.g., by altitude).

Some respondents advocated for the value of Network RID which is not explicitly recognized in the FAA's final rule for RID, but may still be used by UAS Operators. A number of responses also appreciated the fact that UTM may provide a means to protect Operator privacy.

Several responses to the UAS industry survey recommended considering other cooperative methods for increasing situational awareness in lieu of RID: these included FLARM and ADS-B among other signal transmissions. However, Sub-Group 1 was asked to focus specifically on the intent of the RFI which was to consider the usefulness of RID information to operators in low altitude airspace. Therefore, these recommendations were noted and forwarded to the other sub-groups, but did not factor into Sub-Group 1's recommendations to the Task Group.

Analysis

Situational awareness is a necessary practice for the safe operation of any aircraft. According to the FAA, situational awareness is the "accurate perception and understanding of all the factors and conditions within the four fundamental risk elements (pilot, aircraft, environment, and type of operation) that affect safety before, during, and after the flight[1][2]." The increased availability of inflight technology and information has provided many opportunities for improved situational awareness, however there are many examples where the same technology and increase in access to information can result in a loss of situational awareness[3]. The FAA tasked this group to obtain feedback from the low altitude aviator community to determine whether RID information could increase situational awareness.

Based on the findings of this Sub-Group, three major areas were identified for analysis to determine whether RID is a useful tool that could improve situational awareness and safety for low altitude aviators:

1. Usefulness and Safety of the Accessibility to RID
2. Increased Workload and Distractions of RID (human factors)

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1 https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/media/risk_management_hb_change_1.pdf

2 https://www.faasafety.gov/gslac/ALC/course_content.aspx?cID=408&sID=649&preview=true#:~:text=Situational%20Awareness.during%2C%20and%20after%20the%20flight

3 Parson, S. (2016). Battling the Attraction of Distraction. *FAA Safety Briefing*, p. 14. https://www.faa.gov/news/safety_briefing/2016/media/MayJun2016.pdf

3. Access to RID Information

Usefulness and Safety of the Accessibility to RID

Most respondents believe having availability to RID information would not only be useful but could also increase safety if made available to one's Electronic Flight Bag (EFB) and/or electronic avionics display.

Over 73% of respondents believe seeing RID information would be either very or somewhat useful. Approximately the same percentage also believes having RID information made available to one's EFB and/or electronic avionics display could significantly or somewhat increase safety (71%). Presumably, this indicates many pilots believe having access to drone RID in flight would be useful or provide added safety in the form of increased situational awareness through knowledge of where their aircraft is relative to drones. This did not come as a surprise to the group because when given the opportunity, most individuals instinctively choose an option that offers more perceived utility or benefits.

However, it is premature to say RID would provide a blanket increase in usefulness or safety. Just over 17% believed access to RID would be somewhat or completely useless, with most of those respondents believing it completely useless. Almost 10% believed RID would somewhat or significantly decrease safety. As described in the findings, the reasons ranged from added disruptions, increased workload, and unnecessary distractions, e.g. distractions that prevent a pilot from visually scanning for airborne objects. Even without accessibility to RID information, operating at low altitudes and near airports are high workload environments that requires significant attention and would likely account for a portion of respondents viewing added information as a concern to safety.

Balancing the natural inclination of wanting more information with the desire to ensure safety can also explain the drop from 46% who believed RID would be very useful, to 35% who believed it would significantly increase safety. Yes, RID information can be useful, but there needs to be consideration of whether such information could result in unintended consequences, which is explained further below.

In addition to how the data can be interpreted, the committee recognizes there are certain limitations of the survey (e.g., length and scope), and the potential limitation of RID knowledge (e.g., regulatory and technological limits) on the part of the respondent.

While the empirical data indicates RID information could be useful and provide increased safety, further investigation, outreach, and education should be conducted to identify any safety issues with RID use by low altitude aviators not identified here, and to provide further awareness of RID to the entire aviation community (e.g., FAA WINGS Pilot Proficiency Program).

Increased Workload and Distractions of RID

During periods of high workload, pilots can experience environmental, physiological, and psychological stress that "can affect decision-making skills and increase a pilot's risk of error in the flight deck[4]." Fortunately, technology such as electronic flight displays, GPS, and EFBs, can reduce pilot workload and increase situational awareness. However, too much information and technology also has its pitfalls[5].

When asked whether having RID information available to one's EFB and/or electronic avionics display, a majority (54%) believed that it would either significantly or somewhat increase workload. This leads us to believe there is concern amidst the low altitude aviator community to what the FAA, research, and past accidents have shown- too much information has the potential to result in undesired consequences. This concern is also supported with data indicating 67% of respondents would want the capability to filter extraneous and unnecessary RID information, and by comments such as "…filter this [RID] information so the amount of drones does not clog the display…", "The less clutter on the display, the better." "I don't want my screen cluttered." "Too much information can cause sensory overload." "…it will clutter the display." However, a significant number of respondents were neutral (37%), which could indicate a lack of awareness of what RID is and how such information would increase or decrease workload.

As mentioned earlier, technology and information can reduce pilot workload and increase situational awareness. In fact, approximately 8% believe that workload would decrease in some fashion. While there were no comments that could confirm, it would be reasonable to infer RID can provide the ability to easily identify some drones, just as ADS-B In can make identifying some piloted aircraft easier. However, just as too much reliance on technology (e.g., ADS-B) can create complacency, so too could access to RID information. These issues should be further studied.

It is recommended that the FAA work collaboratively with academia, industry, and other relevant stakeholders (e.g., ASSURE, GAJSC, USHST, UAST) to address these safety and human factors issues involving increased workload and distractions prior to making RID information available into piloted aircraft technologies (e.g., EFB, electronic flight instruments). In addition, standards (as necessary), filtering methods, and techniques should be addressed. Finally, an outreach campaign to educate and bring awareness to the low altitude aviator community about what RID is, how it can be used for situational awareness (e.g., FAA WINGS Pilot Proficiency Program).

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[4] https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/media/risk_management_hb_change_1.pdf

[5] Parson, S. (2016). Battling the Attraction of Distraction. *FAA Safety Briefing*, p. 14. https://www.faa.gov/news/safety_briefing/2016/media/MayJun2016.pdf

Access to RID Information

After considering the safety and human factor issues to using RID, the next challenge is how to best make this information accessible to low altitude aviators, both technologically and economically.

While most respondents believe RID information in the flight deck would be useful, there is a near unanimous consensus (92%) that such information should be integrated into existing systems, such as EFBs and electronic avionics displays.

Many low altitude aviators, who currently pay taxes and fees that support the nation's aviation infrastructure, have faced many expensive and unfunded equipment mandates (e.g., ADS-B) and are understandably interested in using current technology and infrastructure on a voluntary basis. Many aircraft have very little room for another device or are unable to physically install additional equipment, and as discussed earlier, additional devices or screens can create increased workload or distractions.

Over 80% of respondents currently use an EFB or have an electronic avionics display installed on their aircraft, which would indicate wide adoption and usage of a widely used technology and available infrastructure. It would behoove industry and the FAA to leverage voluntary access to RID information to piloted aviators through these widely available and used resources instead of new and costly equipment.

It is recognized that low altitude aviators consist of a diverse group of pilots and operators who may desire different options from what is recommended here. Sub-Groups 2 and 3 of this tasking group explore those alternative options.

It is recommended after the appropriate safety and human factor issues are considered, RID information be made available and adopted on a voluntary basis utilizing current piloted aviation technological infrastructure, such as EFBs and electronic avionics displays.

UAS/Manufacturers/Service Suppliers Survey

As mentioned in the methodology and findings section, this group determined the importance of reaching out to the UAS industry to obtain their input on the usefulness of RID to low altitude aviators.

Responses to the UAS stakeholder industry generally aligned with concerns of the low altitude aviators, including the need to develop appropriate methods or techniques to filter RID information in ways that will maximize situational awareness without inundating operators in low altitude airspace with data (e.g., by altitude).

Some respondents advocated for the value of Network RID which is not explicitly recognized in the FAA's final rule for RID but may still be used by UAS Operators. A number of responses also appreciated the fact that UTM may provide a means to protect Operator privacy.

While not directly within the scope of this Sub-Group's effort, the Sub-Group supports the FAA prioritizing efforts to make RID available via UTM for situational awareness purposes.

Recommendations

The effort from this group has found that while low altitude aviators seem to find RID information useful during the operation of an aircraft, that information must be carefully disseminated using currently used infrastructure as to not create safety and human factors concerns, such as distractions and increased workload. This group therefore respectfully proposes the following recommendations for consideration by the DAC, FAA, and aviation industry:

Tasking Group 9 Sub-Group 1 Recommends:

1. The FAA work collaboratively with academia, industry, and other relevant stakeholders to determine and resolve safety and human factors issues prior to making RID information available for piloted aircraft.
2. RID information should be made available and adopted only on a voluntary basis utilizing current piloted aircraft technologies.
3. The FAA work collaboratively with academia, industry, and other relevant stakeholders to determine and address appropriate standards (as necessary), filtering methods, and techniques prior to making RID information available for piloted aircraft.
4. The FAA develop an outreach campaign to educate the low altitude aviator community about what RID is, how it can be used for situational awareness, and its limitations.

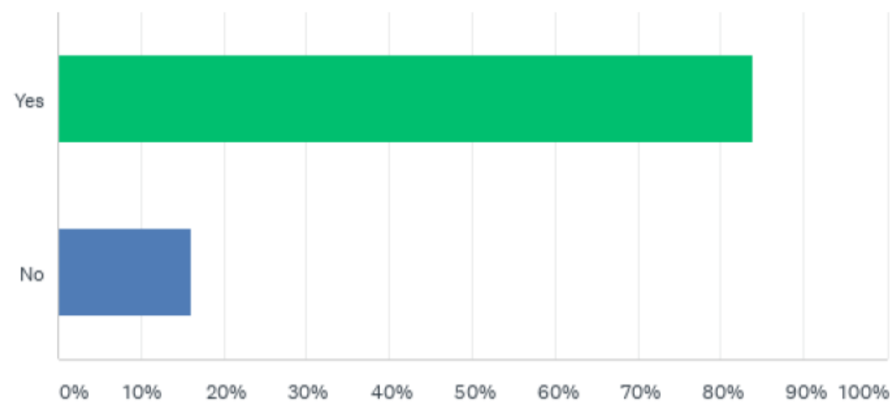
Survey Results

Remote ID and Low Altitude Aviators - Onboard Pilot Survey

Friday, May 21, 2021

Q1: Do you (or your membership) currently use an electronic flight bag (e.g., Garmin Pilot, Foreflight), or electronic avionics display in flight?

Answered: 328   Skipped: 2



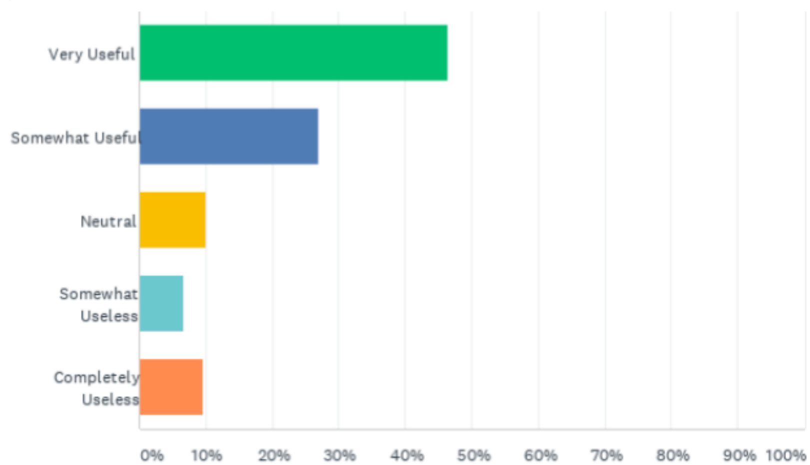
Q1: Do you (or your membership) currently use an electronic flight bag (e.g., Garmin Pilot, Foreflight), or electronic avionics display in flight?

Answered: 328 Skipped: 2

ANSWER CHOICES	RESPONSES	
Yes	83.84%	275
No	16.16%	53
TOTAL		328

Q2: Many unmanned aircraft (UAS) e.g. drones, hobbyist R/C, operate below 400ft AGL will be required to transmit a variety of location and identification information including ID Number, Location, Altitude, Velocity, Control Station Location, and Emergency Status (Remote ID). Assuming that information is available to you in-flight, please rate the value/usefulness in seeing this Remote ID information in the flight deck.

Answered: 329 Skipped: 1



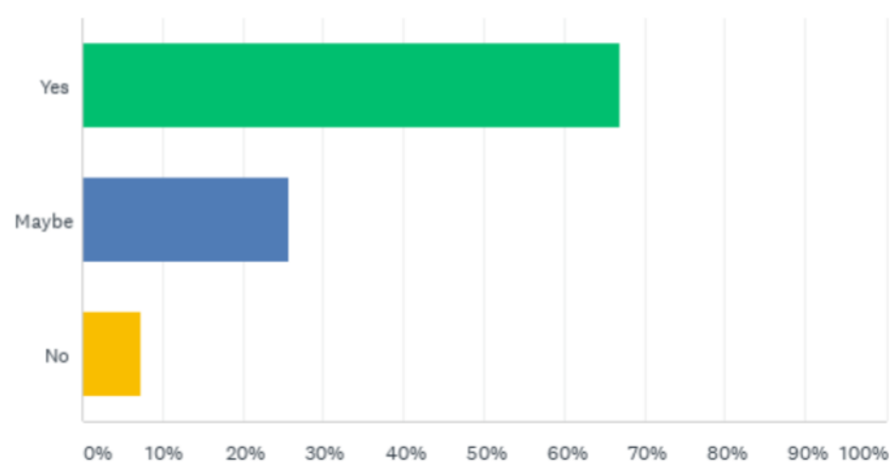
Q2: Many unmanned aircraft (UAS) e.g. drones, hobbyist R/C, operate below 400ft AGL will be required to transmit a variety of location and identification information including ID Number, Location, Altitude, Velocity, Control Station Location, and Emergency Status (Remote ID). Assuming that information is available to you in-flight, please rate the value/usefulness in seeing this Remote ID information in the flight deck.

Answered: 329 Skipped: 1

ANSWER CHOICES	RESPONSES	
Very Useful	46.50%	153
Somewhat Useful	27.05%	89
Neutral	10.03%	33
Somewhat Useless	6.69%	22
Completely Useless	9.73%	32
TOTAL		329

Q3: Would the capability to filter extraneous and unnecessary UAS Remote ID information and targets through your electronic flight bag and/or electronic avionics display settings be important to your decision to voluntarily use UAS Remote ID information in the flight deck for situational awareness?

Answered: 327 Skipped: 3



21

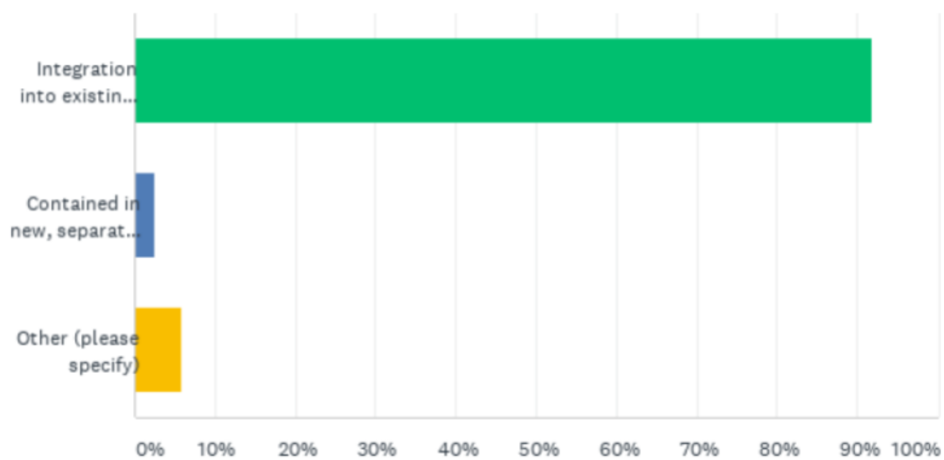
Q3: Would the capability to filter extraneous and unnecessary UAS Remote ID information and targets through your electronic flight bag and/or electronic avionics display settings be important to your decision to voluntarily use UAS Remote ID information in the flight deck for situational awareness?

Answered: 327 Skipped: 3

ANSWER CHOICES	RESPONSES	
Yes	66.97%	219
Maybe	25.69%	84
No	7.34%	24
TOTAL		327

Q4: If situational awareness enhancing information on unmanned aircraft (Remote ID) was available to you inflight, what do you believe is the most effective means of cockpit integration of that information would be?

Answered: 328 Skipped: 2



22

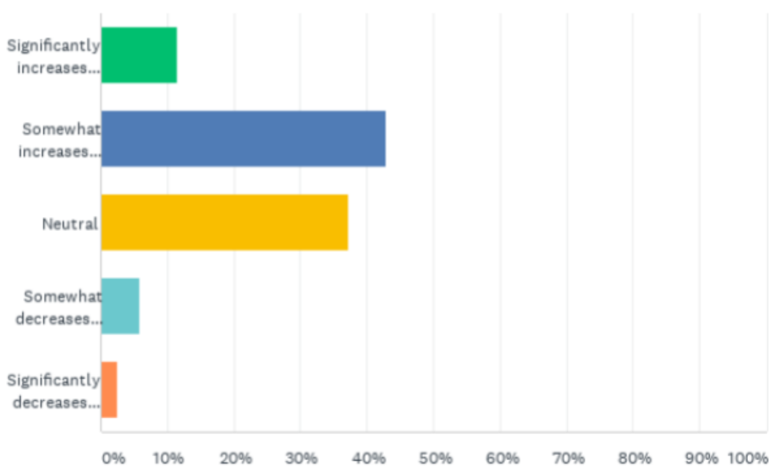
Q4: If situational awareness enhancing information on unmanned aircraft (Remote ID) was available to you inflight, what do you believe is the most effective means of cockpit integration of that information would be?

Answered: 328 Skipped: 2

ANSWER CHOICES	RESPONSES	
Integration into existing systems (EFB, electronic avionics display)	91.77%	301
Contained in new, separate stand-alone system	2.44%	8
Other (please specify)	5.79%	19
TOTAL		328

Q5: Do you think that having Remote ID information in your EFB or electronic avionics display would increase or decrease your inflight workload?

Answered: 328 Skipped: 2



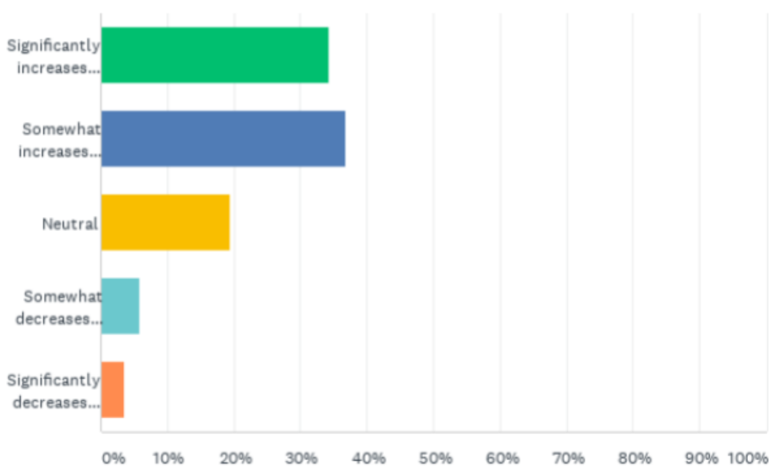
Q5: Do you think that having Remote ID information in your EFB or electronic avionics display would increase or decrease your inflight workload?

Answered: 328   Skipped: 2

ANSWER CHOICES	RESPONSES	
Significantly increases workload	11.59%	38
Somewhat increases workload	42.99%	141
Neutral	37.20%	122
Somewhat decreases workload	5.79%	19
Significantly decreases workload	2.44%	8
TOTAL		328

Q6: Do you think having additional Remote ID information on your EFB/electronic avionics display would increase or decrease safety?

Answered: 329   Skipped: 1



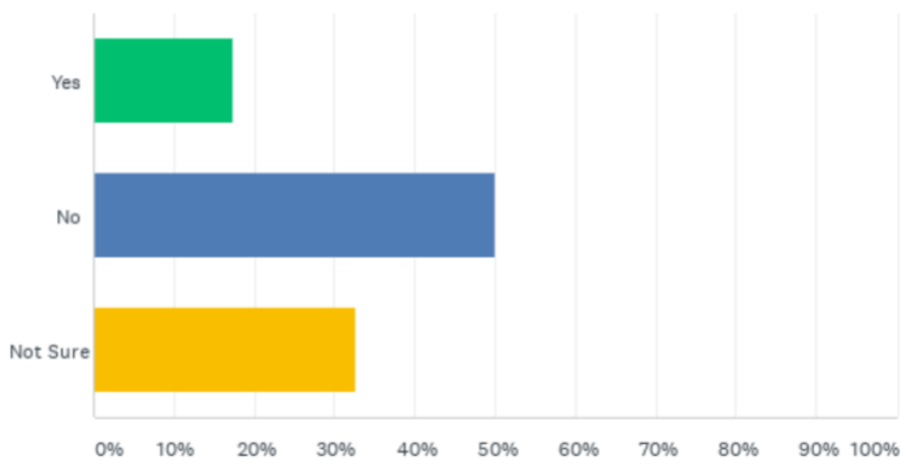
Q6: Do you think having additional Remote ID information on your EFB/electronic avionics display would increase or decrease safety?

Answered: 329   Skipped: 1

ANSWER CHOICES	RESPONSES	
Significantly increases safety	34.35%	113
Somewhat increases safety	36.78%	121
Neutral	19.45%	64
Somewhat decreases safety	5.78%	19
Significantly decreases safety	3.65%	12
TOTAL		329

Q7: Did you or a representative of your organization respond to the FAA's RFI for Remote ID and low altitude aviators?

Answered: 322   Skipped: 8



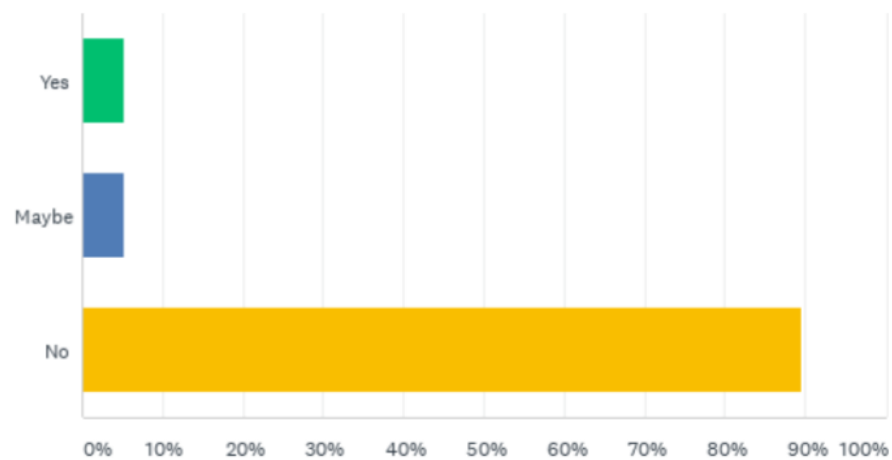
Q7: Did you or a representative of your organization respond to the FAA's RFI for Remote ID and low altitude aviators?

Answered: 322   Skipped: 8

ANSWER CHOICES	RESPONSES	
Yes	17.39%	56
No	50.00%	161
Not Sure	32.61%	105
TOTAL		322

Q8: Has your position changed from your original RFI response?

Answered: 57   Skipped: 273



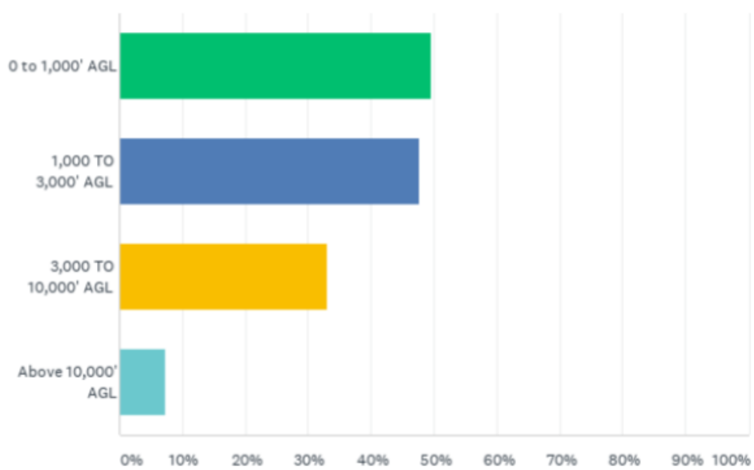
Q8: Has your position changed from your original RFI response?

Answered: 57 Skipped: 273

ANSWER CHOICES	RESPONSES	
Yes	5.26%	3
Maybe	5.26%	3
No	89.47%	51
TOTAL		57

Q11: What altitude ranges represent your typical operations (outside of takeoff and landing)? (Please select all that apply)

Answered: 318 Skipped: 12



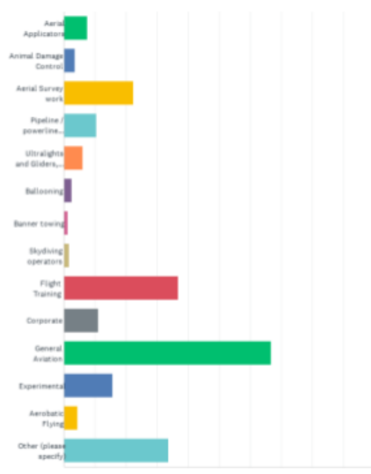
Q11: What altitude ranges represent your typical operations (outside of takeoff and landing)? (Please select all that apply)

Answered: 318 Skipped: 12

ANSWER CHOICES	RESPONSES	
0 to 1,000' AGL	49.69%	158
1,000 TO 3,000' AGL	47.80%	152
3,000 TO 10,000' AGL	33.02%	105
Above 10,000' AGL	7.23%	23
Total Respondents: 318		

Q12: Which operating environments do you regularly fly in? (Select all that apply)

Answered: 318 Skipped: 12



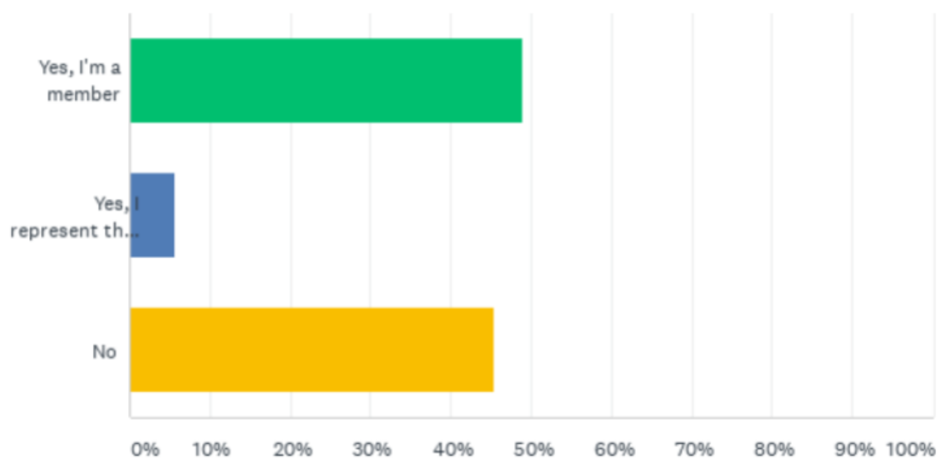
Q12: Which operating environments do you regularly fly in? (Select all that apply)

Answered: 318 Skipped: 12

ANSWER CHOICES	RESPONSES	
Aerial Applicators	7.55%	24
Animal Damage Control	3.46%	11
Aerial Survey work	22.33%	71
Pipeline / powerline patrol	10.38%	33
Ultralights and Gliders, Soaring, Powered Hang Gliding	5.97%	19
Ballooning	2.52%	8
Banner towing	1.26%	4
Skydiving operators	1.57%	5
Flight Training	36.79%	117
Corporate	11.01%	35
General Aviation	66.67%	212
Experimental	15.72%	50
Aerobatic Flying	4.40%	14
Other (please specify)	33.65%	107
Total Respondents: 318		

Q13: Are you a member of, or a representative of an organization that represents pilots who regularly operate at low altitudes?

Answered: 319 Skipped: 11



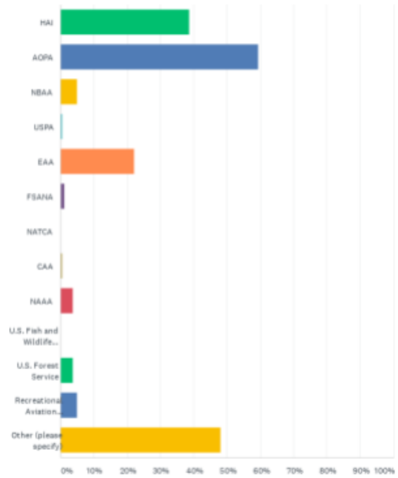
Q13: Are you a member of, or a representative of an organization that represents pilots who regularly operate at low altitudes?

Answered: 319 Skipped: 11

ANSWER CHOICES	RESPONSES	
Yes, I'm a member	48.90%	156
Yes, I represent the organization	5.64%	18
No	45.45%	145
TOTAL		319

Q14: Which organizations do you represent? [Please choose all that apply]

Answered: 158 Skipped: 172



Q14: Which organizations do you represent? [Please choose all that apply]

Answered: 158 Skipped: 172

ANSWER CHOICES	RESPONSES	
HAI	38.61%	61
AOPA	59.49%	94
NBAA	5.06%	8
USPA	0.63%	1
EAA	22.15%	35
FSANA	1.27%	2
NATCA	0.00%	0
CAA	0.63%	1
NAAA	3.80%	6
U.S. Fish and Wildlife Service	0.00%	0
U.S. Forest Service	3.80%	6
Recreational Aviation Foundation	5.06%	8
Other (please specify)	48.10%	76
Total Respondents: 158		

ANNEX 2 - Sub-Group 2

Report

Sub-Group 2 Scope

In December 2020, Task Group 9 divided its efforts into three focus areas. Sub-Group 2 was directed to explore existing technologies that can provide situational awareness to low altitude operators (traditional aircraft, general aviation, gliders, unmanned).

Approach

Using publicly available information and leveraging the knowledge and experience of its member subject matter experts, Sub-Group 2 developed a matrix describing existing and near-term technologies that can provide situational awareness to low altitude operators. This extended beyond Remote ID, sampling technologies in the categories of ADS-B, Detect and Avoid, and strategic deconfliction. The goal of this effort was to describe capabilities, identify technology gaps, highlight any workload or human factors issues, and estimate cost information to help inform the recommendations of Task Group 9.

Description of Matrix

The matrix is organized into two major blocks. The first block are technologies that allow operators of UAS to become aware of piloted aircraft. The second block are technologies that allow operators of piloted aircraft to become aware of UAS. For each technology within a block, the columns of the matrix contain information on hardware and/or software implementation and data provided, technology readiness level (TRL) and development status, an assessment of any associated workload or human factors issues, identification of any gaps in facilitating use for low altitude operators, and a rough estimate of development and end users costs.

The first section of each block describes the hardware and/or software implementation of each technology, and the description offers additional context about the intended use of the technology, its features, and limitations.

The TRL and development status section include whether the technology currently exists as a commercial offering or product, and whether the technology is widely available. The scale used for TRL is one commonly used by NASA and DoD with (1) representing fundamental research and (9) representing successful performance in operational test and evaluation.

Elements of the data section include the contents of a message or data packet, the coverage area (range) over which the data is provided, and the hardware and/or software required to make use of the data, for example a cockpit/Ground Control Station (GCS) instrument, display, or handheld device.

The final section for each block describes technology gaps, workload or human factors issues, and costs. Members used the information in the first three sections of the matrix to identify technology gaps. The group attempted to answer the question: What is missing that would make this existing technology a better situation awareness tool for ALL low altitude aviators? Most members of Sub-Group 2 are piloted aircraft operators and many are highly experienced in both piloted and UAS operations. This wealth of knowledge and experience was used to assess the workload or human factors imposed by the use of a given technology.

Cost is complex and challenging to estimate, especially for technologies and systems which are a blend of software, hardware, and infrastructure and can be a public, private, or a partnership. The Sub-Group opted to estimate rough order of magnitude cost of development of the total technology solution and the cost to the end user. For each, there is a breakdown of components which contribute to the estimate. The scaling, shown below, reflects this wide variation in the implementation of these technologies:

1 = up to an including $1,000,

2 = greater than $1,000 but less than $10,000,

3 = greater than $10,000 but less than $100,000,

4 = greater than $100,000 but less than $1,000,000,

5 = greater than $1,000,000 but less than $10,000,000,

6 = greater than $10,000,000.

Findings

1. There are a variety of existing and near-term technologies that provide situational awareness of traditional aircraft operations.

   ADS-B is the primary existing technology, which is implemented through a blend of public infrastructure and privately owned devices developed by private companies. There are many options for aviators to make use of ADS-B. While on the ground, interfaces to feeds and ground sensor networks can be monitored via web browser moving map displays. While in the air, cockpit displays or electronic flight bags (EFBs) can be monitored for traffic information. Many UAS manufacturers are equipping UAS with ADS-B In receivers to implement avoidance of traditional piloted aircraft.

There is also ongoing technology development of other solutions. These involve a range of implementations, such as onboard or ground-based passive and active sensors. This development of these technologies has largely been driven by the responsibility placed on UAS as a new entrant in the National Airspace System (NAS) to yield the right of way to all piloted aircraft. As such, the significant cost of development and long-term use of these technologies is borne entirely by the UAS community. At this time, none of these are widely available. Current TRL levels range from 7-9.

2. There are few existing and near-term technologies that provide situational awareness of unmanned aircraft operations to pilots of traditional aircraft.

   There are existing solutions which provide notification and depiction of UAS operating areas, but few which provide near real time information of specific UAS position, speed, and altitude.

   UAS operating at low altitudes are currently not commonly permitted to equip with transponders/ADS-B Out. UTM remains in development. Remote ID is imminent, but it is unclear how Remote ID information will be made available in the cockpit of general aviation aircraft.

3. The following technology issues exist for ‘direct’ use of Broadcast Remote ID by low altitude operators. ‘Direct’ means transmission of the Broadcast signal from the airborne UAS to be received by a piloted aircraft by a separate receiver device such as a smartphone.

   - Depending on the altitude of operation and cruise speed, the range limitations of the most common Broadcast implementations likely result in little to no situational awareness value to low-altitude operators in traditional aircraft.

   - There are human factors associated with scanning additional/multiple devices and displays which may use different symbology and alerting concepts. This is especially true for low-altitude operations and phases of flight for which workload is already elevated.

4. Relying on Broadcast Remote ID information for situational awareness between UAS and traditional piloted aircraft operations presents numerous challenges. This approach may only be truly useful for all low-altitude operators if the following technologies/ capabilities are developed and become widely available:

- Broadcast Remote ID information is sensed on the ground by dedicated sensor networks, and/or voluntary users of Remote ID related devices and apps. This is a form of 'network' solution. The information is then aggregated, made filterable, and displayed via a web interface. This interface can be used for pre-flight planning for all aviators, and for integration with traditional aircraft traffic data (from ADS-B feeds and/or non-cooperative sensors) onto displays suitable for the UAS GCS.

- This same feed of UAS Remote ID information is made available in the cockpit of traditional aircraft. To avoid an increase in workload, this should be integrated with traditional aircraft traffic information via EFB or cockpit traffic display. This capability appears to be a gap - How can the Remote ID information be made available in the cockpit of traditional aircraft? It is unclear that carrying a device with cellular internet connection in the cockpit is a viable option. One option may be satellite link, but this could be costly for end users. In either case, the use of externally mounted antennas for improved performance on traditional aircraft is a technical, safety, and compliance consideration.

- Making traffic information filterable by range and altitude is key for this technology to be valuable as an situational awareness tool. EFB/cockpit/GCS displays of traffic data should not be cluttered by information that is not operationally relevant. Providing timely information is also important given the speed of traditional aircraft, the previously mentioned range limitations of Remote ID, and the relatively short duration of most low altitude UAS operations.

However, the FAA should seek to better understand the accuracy of remote identification receivers as solutions have yet to become widely available.

5. Other solutions with potentially better detection range and coverage, may be a better tool for providing situational awareness to low altitude operators, but providing useful and timely information in the cockpit of traditional aircraft remains a technology gap. Such solutions include ground-based surveillance networks and UTM/Network Remote ID.

Sub-Group 2 Feedback

Other than receiving notices to airmen (NOTAMs) regarding operating areas, there is currently no widely-available technology providing low altitude operators of traditional piloted aircraft with situational awareness of the position, speed, and altitude of airborne UAS.

There are technology gaps to close in order to leverage Remote ID to this purpose. Remote ID was intended as a security and public safety measure, not as a situational awareness or traffic awareness capability.

However, existing technologies (like ADS-B on piloted aircraft, and inexpensive ADS-B In receivers on UAS) present opportunities for increased situational awareness as well as deconfliction.

Situational Awareness Technology Matrix

Situation Awareness	Technology	Implementation	Description	Currently Exists	TRL	Widely Available	Public/Private/Mix/Partnership	Data	Range	Display: Preflight	Display: Inflight	Workload / Human Factors	Technology Gaps	Cost to Develop - Order of	Cost to End User - Order of
Traditional Aircraft --> UAS [Technologies that allow operators of UAS to become aware of traditional aircraft]	ADS-B In	Onboard ADS-B In receiver (1090ES & UAT) - Installed on the UAS to sense ADS-B Out from traditional aircraft - may be used by onboard autonomy or transmitted to GCS	2020 Mandate for ADS-B Out on traditional aircraft. Most applicable in Mode C veil. Lower adoption for traditional aircraft typically operating at low altitudes	Yes	10	Yes	Mix - Private hardware device communicates with other private devices and with public infrastructure	ADS-B Target State Vector (Lat,Lon,Altitude, Horizontal Vel, Vertical Vel)	30NM / +/-3,500 FT	NA - status that onboard device is functional	Used by onboard automation; or transmitted over C2 or data link to a CDTI display at the GCS	Trust in automation; latency in downlink to GCS could increase workload	Complete onboard DAA solution for small UAS (which includes avidance algorithm and interface to autopilot)	Development of receiver hardware: 4	Operator / Owner - Purchase of device: 2 ; Installation: 2
		Ground-Based ADS-B In receiver (1090ES & UAT), Single or Networked (Private) - Fed to UAS GCS or uplinked to UAS for use by onboard autonomy		Yes	10	Yes	Mix - Private Instrastructure communicates with other devices and with public infrastructure	ADS-B Target State Vector (Lat,Lon,Altitude, Horizontal Vel, Vertical Vel)	30NM / +/-3,500 FT	web or connected GCS display ('Internet Traffic' or network of 'local' sensors)	web or connected GCS display ('Internet Traffic' or network of 'local' sensors)	Airspace awareness displays are typcally separate from GCS/UA control displays. Additional displays increase workload.	Guidance and alerting for the RPIC versus targets on a display	Development of receiver hardware: 4, Development of private networks (depends on scale): 4-6 , Development of display software: 4-6,	Operator or Service Supplier - Ground receiver - 2-3, Software purchase: 1-2, Subscription service: 1-2
		TIS-B (1090ES & 978UAT) - Applies to onboard or ground-based receivers	Allows **transponder equipped** traditional aircraft to be seen by displays connected to ADS-B In receivers	Yes	10	Yes	Mix - Private Instractructure and devices communicate with other devices and with public infrastructure	TIS-B Target State Vector (Lat,Lon,Altitude, Horizontal Vel, Vertical Vel)	30NM / +/-3,500 FT	web or connected GCS display ('Internet Traffic' or network of 'local' sensors)	Use by onboard automation or transmitted to the GCS over C2 or data link; web or connected GCS display ('Internet Traffic' or network of 'local' sensors)	Airspace awareness displays are typcally separate from GCS/UA control displays. Additional displays increase workload.	Guidance and alerting for the RPIC versus targets on a display	Development of receiver hardware: 4, Development of private networks (depends on scale): 4-6 , Development of display software: 4-6,	Operator or Service Supplier - Ground receiver - 2-3, Software purchase - 1-2, Subscription service - 1-2
	Detect and Avoid	Airborne DAA (acoustic, primary radar, computer vision - EO/IR, TCAS). Tydially used by onboard autonomy	Intended to detect traditional aircraft for collision avoidance; Subject to standards and system safety and operational approval processes.	No	7-9	No	Private - Private hardware device senses and/or communicates with traditional aircraft	Target State Vector (Lat,Lon,Altitude, Horizontal Vel, Vertical Vel)	Variable: 3-30km	NA - status that onboard device is functional	Used by onboard automation; or transmitted over C2 or data link to a CDTI display at the GCS	Trust in automation; latency in downlink to GCS could increase workload	Complete onboard DAA solution for small UAS (which includes avidance algorithm and interface to autopilot)	Development of hardware: 4-6, Development of software: 4-6, Certification : 5-6	Airframe OEM or System Integrator - System: 4-5, Installation/ Integration: 4-5
		GBDAA Sensors (acoustic, primary radar, computer vision - EO/IR). Typically used at the GCS. May be uplinked for use by onboard autonomy.		No	7-9	No	Mix - Private Instractructure and devices communicate with other devices and with public infrastructure	Target State Vector (Lat,Lon,Altitude, Horizontal Vel, Vertical Vel)	Variable: 3-30km	web or connected GCS display ('Internet Traffic' or network of 'local' sensors)	web or connected GCS display ('Internet Traffic' or network of 'local' sensors)	Airspace awareness displays are typcally separate from GCS/UA control displays	Guidance and alerting for the RPIC versus targets on a display	Development of hardware: 4-6, Development of private network (depends on scale): 4-6, Development of software - 4-6,	Operator or Service Supplier - Equipment: 4-6, Software purchase: 3-4, Subscription service: 2-3
	Strategic Deconfliction	Ground-based Sensors Network - Not DAA	Intended to detect traditional aircraft for situation awareness only	No	7-9	No	Private	Target State Vector (Lat,Lon,Altitude, Horizontal Vel, Vertical Vel)	Variable: 3-30km	web or connected GCS display ('Internet Traffic' or network of 'local' sensors)	web or connected GCS display ('Internet Traffic' or network of 'local' sensors)	Airspace awareness displays are typcally separate from GCS/UA control displays	Guidance and alerting for the RPIC versus targets on a display	Development of hardware: 4-6, Development of private network (depends on scale): 4-6, Development of software: 4-6, Certification	Operator or Service Supplier - Equipment: 4-6, Software purchase: 3-4, Subscription service: 2-3
UAS --> Traditional Aircraft & UAS [Technologies that allow operators of traditional aircraft to become aware of UAS]	UAS RID (Broadcast)	Mobile phone with RID app, specialized hardware/receiver with display	Intended for Counter-UAS/security. Could the information be provided to manned aviators for SA?	No	7-9	No	Private - Private hardware device communicates with device in/on UAS	RID Message	<1k to >20km depending on equipment	web or device	web or connected GCS display	RID information should be integrated with existing EFB/CDTI displays (with filtering) - additional /separate displays/screens increase workload.	Ability for direct detection via mobile phone from cockpit of traditional aircraft unclear; Other means to view RID information from cockpit of traditional aircraft	Development of hardware: 3-5, Development of software: 3-4, Acceptance /Certification: 2-4	Operator/Owner - Device for detecting or receiving RID information : 1-2
	Strategic Deconfliction	FIS-B (978UAT)	Provides pilots and flight crews of properly equipped aircraft with a cockpit display of certain aviationweather and aeronautical information including NOTAMS	Yes	10	Yes	Mix - Private hardware device communicates with other private devices and with public infrastructure		30NM / +/-3,500 FT	web or EFB	web, EFB, or other device/display (ADS-B equipment)	Low/no additional impact on workload	None	Network/Service:public; Development of receiver hardware: 3-5, Development of software: 3-4	Operator/Owner - Device for detecting or receiving FIS-B information : 1-2; EFB Software Subscription: 1; web: 1
		NOTAMs	DROTAM/NOTAM-D for UAS areas of operation (required by some waivers).	Yes	10	Yes	Public - FAA System	Location + Information	Nation Wide	web or EFB	web or EFB	Low/no additional impact on workload	None	Development of software: 3-5	Operator/Owner - Device for detecting or receiving information
		Ground-based Sensors Netork - Not DAA	Intended to detect UAS for situation awareness only - also for security	No	7-9	No	Private	Target State Vector (Lat,Lon,Altitude, Horizontal Vel, Vertical Vel)	Variable: 3-30km	web, EFB, or other device/display ('Internet Traffic')	EFB, or other device/display	Airspace awareness displays are typcally separate from other cockpit displays	Means of providing information at the cockpit in a manner that does not increase workload	Development of hardware: 4-6, Development of private network (depends on scale): 4-6, Development of software: 4-6, Certification	Operator or Service Supplier - Equipment: 4-6, Software purchase: 3-4, Subscription service: 2-3

ANNEX 3 - Sub-Group 3

Report

Tasking and Sub-Group 3's Scope

The FAA tasked the Drone Advisory Committee on October 22, 2020 to explore how aircraft pilots operating in the low altitude airspace can improve their situational awareness and reduce collision risk with UAS by using remote identification (RID) information. The original objective for the tasking sprang from the FAA's March 17, 2020 Request for Information (RFI) entitled; "Low Altitude Manned Aviator Participation on UAS Remote Identification." Only 30 responses were received, and the FAA wanted more research on this initiative. Although the first two Sub-Group taskings closely align and in some cases overlap, Sub-Group 3 was tasked to go beyond the limits of the scope of Task Group 9, brainstorm ideas, and explore areas which may improve situational awareness in the low altitude airspace. Sub-Group 3 received the following guidance from Task Lead to answer the following questions:

- How can information be better used to make the airspace safer?
- Are there outstanding policy or regulatory discussions?

Voluntary Participation

The FAA was clear in its original direction for the tasking; that participation in RID by aircraft pilots should be strictly voluntary. The Sub-Group also sought to minimize new rulemaking to ease implementation resources. The Sub-Group adhered to this direction and ensured that all its recommendations are voluntary and only one recommendation requires a minor policy change.

Path to UTM

The Sub-Group understands that aviation safety is evolving and anticipates safety will evolve with the integration of UAS into the National Airspace System (NAS). Our group agrees a significant milestone in UAS integration is the establishment of an UAS Traffic Management system. The FAA has authored two Concept of Operations documents around UTM and the ASTM has created an international standard for UTM.

The FAA and the Industry has described RID as a major first step toward the development of a total UTM solution for operations in the low altitude airspace. Recognizing that there is still a lot of work to be done to achieve this goal, the Sub-Group decided to explore solutions that are based on the UTM Operational Scenarios in Section 3 of the FAA's NextGen UTM Concept of Operations v2.0 plan. However, in the middle of this project, the FAA released the final Remote Identification Rule. The final rule did not include a Network RID solution, which is a significant part of the UTM version two plan. The Sub-Group quickly shifted gears and explored alternative voluntary solutions the FAA may implement to fill the gaps created by the exclusion of a mandatory Network RID requirement.

Industry Lead Recommendations

Realizing that the FAA has a limited budget and cannot spend all their funds on UAS endeavors, the Sub-Group wants to be clear from the onset that industry should be the driving force behind the Sub-Group's recommendations; and to be endorsed and encouraged by the FAA.

Assumptions Based on Written Communications

Sub-Group 3 agreed over the course of this project on the following assumptions, which are based upon multiple written communications and plans. These assumptions created a common framework to reduce misunderstandings and ensure that all the members were working from the same playbook. This helped drive the Sub-Group's recommendations:

A. **Collision Avoidance and RID:** UAS RID was never meant to be used for aircraft separation, collision avoidance, or as a tactical deconfliction solution. The primary responsibility for collision avoidance from piloted aircraft rests with the UAS Remote Pilot-In-Command (RPIC) on the ground (14 CFR 107.37). This is not to say that aircraft pilots are absolved from maintaining vigilance to see-and-avoid other air traffic (14 CFR 91.113) including UAS operating in the NAS.

B. **No Network RID Requirement:** The FAA did not include a Network based RID requirement in the final RID rule. Excluding use for RID, using a Network for deconfliction through flight-intent planning may be effective and does not conflict with the RID rule. A Network solution remains a driving force in the plan for BVLOS UTM system (UTM ConOps V2.0).

C. **Situational Awareness for Low Altitude Operations:** Aircraft pilots operating VFR are not required to file a FAA flight plan, and VLOS RPICs (Part 101e and 107) are not required to share flight intent before takeoff, but if operating near or below 400' AGL, are encouraged to, at a minimum, utilize services to identify operations that could impact their route of flight as part of their pre-flight responsibilities (UTM Con Ops v2.0, Page 24). With a voluntary intent reporting and data exchange capability for both aircraft pilots and UAS operators, along with D below, UTM may offer additional situational awareness tools beyond RID.

D. **Utilize Ground Based Sensors to Receive Broadcast RID and Detect Non-Participating or Non-Compliant UA, and Non-Participating Piloted Aircraft:** A key to achieving the goals of a successful UTM system involves integrating Broadcast RID information into the system. Broadcast RID messages can be captured by ground-based sensors and fed to UAS Service Suppliers and to FAA systems including SWIM and potentially FIMS. Sensors can be installed, initially, around cities and sensitive locations to capture Broadcast RID information and integrate the data into the UTM system. Additional sensors such as RF, electro-optical, acoustic, and radar can be added to installations to detect non-participating/compliant UAS and non-participating piloted aircraft that are not transmitting RID or ADS-B Out information.

E. **DAA for BVLOS Flight:** In UTM ConOps V2.0, paragraph 2.7.1.2, the FAA states; "UAS Operators desiring to operate in areas with high density or heterogeneous traffic may be required to equip with Detect and Avoid (DAA) technologies to meet these responsibilities." DAA technologies will be a Tactical deconfliction requirement for autonomous and BVLOS operations in the UTM/UAM, and thus is outside the scope of this Sub-Group's tasking. This Sub-Group concentrated on voluntary RID type solutions that will improve situational awareness and strategic deconfliction, in the low altitude airspace.

F. **Waivers Required for BVLOS:** BVLOS flight is presently not allowed without a waiver from the FAA. And even under a UTM/UAM system, the FAA has suggested that until further rulemaking occurs, no BVLOS flights without a waiver will be allowed either. (UTM ConOps V2.0, paragraph 1.1).

G. **FAA's Continued Investment in LAANC:** The FAA has invested a great deal of effort and time in developing and continuing to develop an inclusive federated UAS Service Supplier (USS) – or Network – architecture (FAA Announces Application Period for LAANC, February 24, 2021). Currently, this service is only offered for controlled airspace approvals with the information shared on a limited basis with ATC. These airspace approvals are not shared with other USSs for the benefit of other UAS operators or aircraft pilots that may be operating in the same area. Also, currently, Drone Zone airspace requests as well as Public Safety COA airspace grants are not shared with other UAS operators. A fully inclusive UTM and UAM system may eventually require participation (either through active or passive participation) by all users of the low altitude airspace.

Summary of Recommendations

Sub-Group 3 met 16 times between December 15, 2020 to April 26, 2021. The members of the Sub-Group represent airline pilots, public safety pilots, pilot associations as well as UAS commercial and recreational pilots and operators from manufacturers, service providers and associations. A list of contributors is shown at the end of this report.

Our Sub-Group created low altitude situational awareness recommendations which we hope will provide incremental improvements as we evolve to a fully functional UTM system. We also felt it was important to make recommendations which could be implemented quickly and others which would require time to develop and introduce.

Recommendations to Improve UAS & Piloted Aircraft Situational Awareness at Low Altitudes	***Voluntary ADS-B In Use by UAS Operators***	***Radio use by UAS Operators***	***Voluntary Onboard Access to RID for Low Altitude Aviators***	***Voluntary Notify & Fly***	***Ground Based RID In Detection Network***

Recommendations

#1 Voluntary ADS-B In Use by UAS Operators

As a result of the ADS-B Out mandate, a significant number of piloted aircraft are broadcasting location information. This information can be used by UAS operators today to gain increased situational awareness of piloted aircraft in the area. This increases safety to users of the NAS by aiding UAS operators in their responsibility to remain clear of piloted aircraft.

Recommendation: We propose that the FAA encourage UAS operators, developers, and manufacturers to leverage ADS-B In technologies. This proposal builds on UTM ConOps v2.0, Scenario V2-3: *Option 3 – UAS and Manned Aircraft On-Board Cooperative Equipment*. This recommendation primarily benefits UAS operators in areas where ADS-B Out is required. However, piloted aircraft operating outside of airspace where ADS-B Out is required are often transmitting ADS-B Out. As ADS-B Out equipage rates increase, this benefit will increase in other controlled and uncontrolled airspace. In addition, aircraft pilots will benefit from the increased assurance that UAS operators have the means to avoid piloted aircraft.

This recommendation leverages existing technology that is already used broadly, and whose use is encouraged by the FAA. ADS-B receivers used by UAS operators could be optimized to audibly and visually alert that piloted aircraft traffic is in the vicinity or approaching at low altitudes. This group acknowledges that not all piloted aircraft will be equipped with ADS-B Out, so UAS operators should take this into account depending on the area of operations.

ADS-B receiver technologies exist and are on the market today. Solutions include laptop dongles, cellular applications, small UAS equipped with ADS-B In by the OEM, and aftermarket solutions for installation in piloted aircraft and UAS.

#2 Radio Use by UAS Operators

Currently, 47 C.F.R, Part 87 defines Aviation Radio Services, including Aircraft Stations and Ground Stations. We propose the FAA considers amending AC 107-2A, Small Unmanned Aircraft System (Small UAS), to include Instructions on Radio Communications and How to obtain a FCC Restricted Radio Telephone Operator's License. We propose the FAA considers amending FAA-H-8083-24, Unmanned Aircraft System Operating Handbook to include instructions on how to obtain a FCC Restricted Radio Telephone Operator's License, as it already includes Radio Communications Procedures. This license would allow UAS Operators to voluntarily transmit on air band VHF Radios on the ground under certain conditions. While not explicitly stated in the aforementioned publications, the Sub-Group understands UAS Operators do not meet the FCC requirements of Aircraft Station restriction: You may only use your hand-held aircraft VHF radio in your aircraft under the terms of your aircraft license[6]. This precludes the use of a handheld aviation band radio by an UAS Operator.

Aeronautical multicom[7] stations provide communications between piloted aircraft and a ground facility for normal, seasonal, or emergency activities. We recommend basic two-way air-band radio communications training be provided by community-based organizations that represent UAS recreational operators.

The proposal is to have the UAS Operator monitor ATC frequencies when operating in controlled airspace including Class E. This recommendation discourages UAS Operator to ATC communication and stipulates no non-emergency communication with ATC for Part 107 or §44809 in a similar manner as described within FAA_H-8083-24.

This enhanced capability would build on UTM ConOps V2.0, Scenario V2-3: *Option 3 – UAS and Manned Aircraft On-Board Cooperative Equipment* and improves situational awareness of both piloted aircraft and UAS Operators.

Currently, UAS Operators do not receive training or testing on radio communications (Private Pilot equivalent is PA.II.D.K6b). We propose leveraging the training available with the FAA's WINGS program (As a method of informing Part 61 Pilots about UAS Operations and RID).

#3 Voluntary Onboard Access to RID Information for Low Altitude Aviators

While UAS operators bear the responsibility of remaining clear of piloted aircraft, aircraft pilots benefit from increased assurance that UAS are abiding by this responsibility. In addition, there may be situations where aircraft pilots may choose to alter their flight path to avoid areas with UAS activity. Awareness of the location of UAS operations is a benefit to low altitude aircraft pilots operating in the vicinity of UAS. The RID rule requires that location be provided by UAS. For this information to be useful, the aircraft pilot must receive the information while they are operating in an area near other UAS, or while planning to enter an area in which UAS are operating. Therefore, this information is most valuable when it can be accessed by aircraft pilots while operating the aircraft.

[6] https://www.fcc.gov/wireless/bureau-divisions/mobility-division/aviation-radio-services/aircraft-stations
[7] https://www.fcc.gov/wireless/bureau-divisions/mobility-division/aviation-radio-services/ground-stations

Recommendation: We propose the FAA develop an acceptance and/or certification path for voluntary adoption of low cost onboard RID monitoring capability for piloted aircraft. This recommendation builds on UTM ConOps v2.0, Scenario V2-3: *Option 3 – UAS and Manned Aircraft On-Board Cooperative Equipment*. Based on survey data gathered by Sub-Group 1, many low altitude aircraft operators believe onboard RID information would be useful. Additional stakeholders include all UTM participants, public safety, cities, airports, and the general public.

There are several options and considerations for voluntary adoption of onboard RID monitoring capability in piloted aircraft. Low cost RID-In receivers can promote voluntary usage by aircraft pilots and operators that can provide additional situational awareness for more users of the NAS. Also, other low-cost options can include using current infrastructure and technology that are already broadly adopted by pilots, such as electronic flight bags, and by approval of non-certified devices through the NORSEE policy. Some aircraft pilots and owners prefer installed solutions, and a path for TSO approval of RID In equipment will enable their use cases.

The RID information must be provided to aircraft pilots in a manner that enhances situational awareness while not increasing workload and distractions. Implementations should consider how to filter the information so that only relevant UAS are displayed to the aircraft pilot. Directly receiving RID broadcast signals will provide situational awareness of UAS that are within range of the receiver. In addition, network-based implementations that provide RID data will allow aircraft pilots the choice to have greater situational awareness of UAS operations in areas beyond range of RID broadcast.

The Tasking Group recommends that the FAA finalizes and accepts a RID Means of Compliance for onboard, integrated RID In devices for piloted aircraft. In addition, the FAA is recommended to develop an acceptance and/or certification path for voluntary adoption of low cost onboard RID monitoring capability using current infrastructure and technology that are already broadly adopted by piloted aircraft as well.

To improve voluntary adoption of onboard RID information in piloted aircraft, the FAA should use the WINGS program to offer training as a method to inform Part 61 pilots about UAS operations and RID.

This recommendation will rely on Industry to produce and sell onboard RID receivers for aircraft pilots and owners.

#4 Voluntary Notify and Fly

While encouraged to utilize services to identify operations that could impact their route of flight as part of their pre-flight responsibilities, neither VLOS UAS operators nor aircraft pilots are required to share intent via UTM. However, sharing of flight intent by UAS operators and aircraft pilots can benefit all NAS stakeholders that voluntarily participate in or benefit from the UTM ecosystem. Beneficiaries of the data include other UAS operators and aircraft pilots, public safety, cities, uncontrolled and non-towered airports, and the general public.

Recommendation: This proposal builds upon UTM ConOps V2.0, Scenario V2-3: *Option 4 – Voluntary Passive UTM Participation.* Similar to LAANC, Notify & Fly is a voluntary mechanism by which a UAS operator or aircraft pilot enters flight intent including location and time into an app on an internet connected device. In essence it allows a UAS operator or aircraft pilot to say, "I'm flying here at this time for this long." USSs and other providers would provide an ability for a user to create 4-dimensional flight intent volumes. While LAANC is limited to controlled airspace, such declarations can be used to scale to all low level airspace including uncontrolled airspace. These intent volumes could then be shared with relevant stakeholders through the UTM system.

While data is valuable there is a concern that an intent volume may be stale. An intent volume does not necessarily mean that a UAS or piloted aircraft operation is currently taking place. This could lead to inefficiencies in airspace utilization. However, the notification can be valuable as a situational awareness tool for other UAS operators and piloted aircraft. Further, this mechanism could be leveraged as a first step in educating UAS communities on the rigors of UTM participation.

As the Notify & Fly process provides a pre-flight planning tool to inform UAS Operators and aircraft pilots of flight intent, we propose that the FAA consider Notify & Fly as a candidate for UPP 3 validation with testing centered around uncontrolled airports as a proof of concept. The UPP 3 validation may be an opportunity to explore how aircraft pilots can best utilize Notify & Fly and related low altitude data. We also recommend that the FAA evaluates how to scale declarations in uncontrolled airspace. To realize the benefits of Notify & Fly industry and/or FAA will need to make Notify & Fly data accessible for primary and secondary stakeholders. Finally, training through WINGS will be a valuable method to educate both UAS Operators and Part 61 pilots about the benefits of Notify & Fly.

In the near term, the expansion or sharing of airspace authorizations between USS providers could act as a model, or first step toward developing a viable UTM solution in conjunction with further FAA rulemaking and full implementation of Broadcast RID.

#5 Ground Based RID-In Detection Network

RID data can be valuable to many stakeholders including not only low altitude aviators but UTM participants, public safety, cities, airports, and the general public. Broadcast RID is inherently local, but other existing technologies can be leveraged to extend the reach of RID to benefit those beyond the transmission range of the broadcast.

Recommendation: Our proposal builds upon UTM ConOps V2.0, Scenario V2-3: *Option 2 – Ground-Based Detection for UAS and Manned Aircraft.* We propose that the FAA explore methods by which Broadcast RID information can be received by ground based RID receivers and transmitted to UTM systems, and when appropriate, to piloted aircraft via TIS-B, network or other mechanisms. Communicating Broadcast RID to the UTM system helps fill an identification gap by sharing information about VLOS operated UAS, which are otherwise not expected to share intent, to other UTM users. Retransmission of Broadcast RID to piloted aircraft could alternatively occur at the receiver, thus filtering would happen at the receiver rather than the transmission stage. This required filtering of data could ensure that aircraft pilots are not overwhelmed with UA information.

A ground-based sensor network can also be used to detect non-participating or non-RID equipped UA as well as non-participating (non-ADS-B) crewed aircraft. This detection would further enhance situational awareness for all NAS stakeholders that participate in or benefit from the UTM ecosystem.

In making our recommendation we took into account a number of considerations. A ground-based system would require siting, installation of detection hardware along with power and backhaul to provide connectivity to UTM providers. Given these parameters, we anticipate detection would not be comprehensive in the beginning and would likely be limited to installation near airports, sensitive locations, and cities. We assumed that the cost of the ground-based sensors will be borne by those that need or voluntarily desire the data or services. Economic feasibility and data requirements would drive installation locations.

A number of steps are required to integrate Broadcast RID information as well as non-participating aircraft. The FAA will need to accept a RID means of compliance. Industry will need to finalize UTM communication standards as well as develop networked receivers and deploy them. Finally, the FAA will need to inform stakeholders such as Part 61 pilots about UAS operations and RID.

Contributors:

• Academy of Model Aeronautics • Air Line Pilots Association (ALPA) • Aircraft Owners & Pilots Association • Agriculture Aviation Organization • Dallas Police Department • DJI • Drone Service Provider Alliance	• FPV Freedom Coalition • Helicopter Association International • Influential Drones, Inc. • Kittyhawk • Los Angeles Department of Transportation • National Agricultural Aviation Association • National Air Traffic Controllers Association	• Northeast UAS Airspace Integration Research Alliance • Praxis Aerospace Concepts International, Inc. • Robotic Skies • Skyward • University of Alaska Fairbanks • Wing • XiDrone Systems, Inc.

Thank you!

ANNEX 4 - Task Group 9 Meetings

DAC Task Group 9 Kickoff

Meeting 1

Task Group 9 - Meeting 1

Task Group 9 Participants

(non-DAC Member participants subject to DOT approval)

- NATCA
- ALPA
- Kansas DOT
- Dallas PD
- Skyward
- AOPA
- Aero NowGen Solutions
- uAvionix
- Wing
- GOEXA
- DJI
- BNSF
- Airspace Systems
- AMA
- AUVSI
- NAMIC
- AIA
- AAAE
- Ariascend
- ASTM International
- Aviation Management Association
- Commercial Drone Alliance
- Experimental Aircraft Association
- FPV Freedom Coalition
- Global Air Drone Academy
- Helicopter Association International
- National Agricultural Aviation Association
- Small UAV Coalition
- State Farm
- Xi Drone Systems

Federal Aviation Administration

DRONE ADVISORY COMMITTEE
October 22, 2020

Background

FAA Issued an RFI on March 17 on Low Altitude Manned Aviator Participation In UAS Remote Identification.

Objectives:
Learn how manned aircraft can receive and use UAS Remote Identification information.
Engage with low altitude manned aviators and other parties who are interested in exploring how UAS Remote ID can improve safety and reduce collision risk between UAS and manned aircraft at low altitudes.

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Federal Aviation Administration

DRONE ADVISORY COMMITTEE
October 22, 2020

Manned-community concerns with RID

Of 30 total responses **11 were from Pilots Associations and Public Safety Orgs.**

Pilot-based organizations see dubious benefits:

- UASs have primary responsibility to avoid manned-aircraft.
- RID is security-centric; it may be inadequate to affect safety.
- Adding RID receive capability would be an additional expense burden to low-level aircraft pilots.
- Low-level pilots are especially concerned with task saturation (e.g., avoiding obstructions & being distracted from the mission).
- Any solutions should integrate with current avionics (EFB, ADS-B).

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Federal Aviation Administration

DRONE ADVISORY COMMITTEE
October 22, 2020

DAC Tasking

Opportunity: Can Remote ID be used to increase situational awareness between manned aviation that routinely operates at low altitudes away from airports and UAS operating in the same airspace?

Tasking: DAC to engage operators in low altitude airspace to obtain feedback on how remote identification might be used to increase situational awareness and use this feedback to develop recommendations on how the FAA can address responses to the RFI.

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Task Group 9 - Meeting 1

Proposal (1/2)

Answer the specific question posed by the FAA:

Voluntary participation in Remote ID for low altitude manned operators.

1) Develop survey of questions to investigate
    a) Should include the broad array of UAS & Manned operation types (some benefits/challenges may apply differently to certain types of operations)
2) Reach out to manned operators and gather information
3) Collate feedback, pros, cons, opportunities, etc
4) Summarize recommendations specific to Remote ID and manned aviation

Proposal (2/2)

Explore the "spirit" of the question:
Ways to further integrate manned and unmanned aviation using available and upcoming technologies & standards to enhance safety in the airspace.

This can help inform the FAA of possible future taskings and studies

a) Besides Remote ID what other information-sharing would be helpful between manned & unmanned (technology agnostic -- focus on the information)
b) What technologies and standards seem most promising for manned/unmanned integration and how could they be used for safe integration?
c) Where could roles & responsibilities be placed between manned and unmanned for such integration & information sharing?
    i) voluntary vs required
    ii) realtime information vs historical or generalized
    iii) push vs pull
    iv) manned participating in UAS technologies like Remote ID vs UAS participating in manned technologies like ADS-B
d) Summarize the above input into recommendations for possible future taskings & studies

Timing and Next Steps

- Please Provide Feedback!
    - General feedback on the 2-part framework above? Are we missing anything?
    - For creating specific subgroups, what components would you be most interested in supporting?
    - Other studies, demonstrations, or areas we should consider that could help to inform the FAA on this tasking?
    - Beyond manned operators, are there other sectors or subject matter experts we should consider reaching out to?
        - Email to satterley@wing.com **NLT Tuesday, December 1**
- Sub Groups
    - Scope defined based on feedback
    - Plan to deliver initial findings to DAC at next meeting (~February)
    - Possible Phase 2 based on Remote ID Rulemaking
- **Next meeting is Tuesday, December 8 at 1:00 ET**

DAC Task Group 9

Meeting 2

Welcome New Members

- NATCA
- ALPA
- Kansas DOT
- Dallas PD
- Skyward
- AOPA
- Aero NowGen Solutions
- uAvionix
- Wing
- GOEXA
- DJI
- BNSF
- Airspace Systems
- AMA
- AUVSI
- NAMIC
- AIA

- AAAE
- Ariascend
- ASTM International
- Aviation Management Association
- Commercial Drone Alliance
- Experimental Aircraft Association
- FPV Freedom Coalition
- Global Air Drone Academy
- Helicopter Association International
- **Joby Aviation**
- National Agricultural Aviation Association
- **OneSky**
- Small UAV Coalition
- State Farm
- **Uber**
- **ULASS Global**
- Xi Drone Systems

Meeting 1 Homework

- Please Provide Feedback!
  - General feedback on the 2-part framework above? Are we missing anything?
  - For creating specific subgroups, what components would you be most interested in supporting?
  - Other studies, demonstrations, or areas we should consider that could help to inform the FAA on this tasking?
  - Beyond manned operators, are there other sectors or subject matter experts we should consider reaching out to?

Meeting 1 Homework

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  - General feedback on the 2-part framework above? Are we missing anything?
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  - Other studies, demonstrations, or areas we should consider that could help to inform the FAA on this tasking?
  - Beyond manned operators, are there other sectors or subject matter experts we should consider reaching out to?

➔ Nearly all in support of a 2-part approach as presented in Meeting 1. One suggestion to turn the second part into its own tasking.

Meeting 1 Homework

- Please Provide Feedback!
  - General feedback on the 2-part framework above? Are we missing anything?
  - For creating specific subgroups, what components would you be most interested in supporting?
  - Other studies, demonstrations, or areas we should consider that could help to inform the FAA on this tasking?
  - Beyond manned operators, are there other sectors or subject matter experts we should consider reaching out to?

➔ Group-wide support for sub-groups to be created.
  - Consider all use cases
  - Consider direction of information flow

Task Group 9 - Meeting 2

Meeting 1 Homework

- Please Provide Feedback!
  - General feedback on the 2-part framework above? Are we missing anything?
  - For creating specific subgroups, what components would you be most interested in supporting?
  - Other studies, demonstrations, or areas we should consider that could help to inform the FAA on this tasking?
  - Beyond manned operators, are there other sectors or subject matter experts we should consider reaching out to?

➔ costs
➔ altitude references
➔ what information is needed
➔ standards
➔ technology solutions
➔ rulemaking
➔ calculating collision risk
➔ UTM ConOps
➔ participation rates
➔ broadcast demonstrations

Meeting 1 Homework

- Please Provide Feedback!
  - General feedback on the 2-part framework above? Are we missing anything?
  - For creating specific subgroups, what components would you be most interested in supporting?
  - Other studies, demonstrations, or areas we should consider that could help to inform the FAA on this tasking?
  - Beyond manned operators, are there other sectors or subject matter experts we should consider reaching out to?

➔ unmanned public safety organizations
➔ geospatial experts
➔ model aircraft community
➔ balloonists and gliders
➔ flight schools
➔ NASA

Approach

Part 1 - Answer the specific question posed by the FAA:
Voluntary participation in Remote ID for low altitude manned operators.

1) Develop survey of questions to investigate
   a) Should include the broad array of UAS & Manned operation types (some benefits/challenges may apply differently to certain types of operations)
2) Reach out to manned operators and gather information
3) Collate feedback, pros, cons, opportunities, etc
4) Summarize recommendations specific to Remote ID and manned aviation

Approach

Part 1 - Answer the specific question posed by the FAA:
Voluntary participation in Remote ID for low-altitude manned operators.

1) Develop survey of questions to investigate
   a) Should include the broad array of UAS & Manned operation types (some benefits/challenges may apply differently to certain types of operations)
2) Reach out to manned operators and gather information
3) Collate feedback, pros, cons, opportunities, etc
4) Summarize recommendations specific to Remote ID and manned aviation

➔ Sub-Group 1 (AMA, AOPA)
   - Review *available* RFI responses; develop survey to send to low altitude community; interview subject matter experts in industry, government, academia
   - Report back to Task Group 9

Approach

Explore the "spirit" of the question:
Ways to further integrate manned and unmanned aviation using available and upcoming technologies & standards to enhance safety in the airspace.

This can help inform the FAA of possible future taskings and studies

a) Besides Remote ID what other information-sharing would be helpful between manned & unmanned (technology agnostic -- focus on the information)
b) What technologies and standards seem most promising for manned/unmanned integration and how could they be used for safe integration?
c) Where could roles & responsibilities be placed between manned and unmanned for such integration & information sharing?
   i) voluntary vs required
   ii) realtime information vs historical or generalized
   iii) push vs pull
   iv) manned participating in UAS technologies like Remote ID vs UAS participating in manned technologies like ADS-B
d) Summarize the above input into recommendations for possible future taskings & studies

Task Group 9 - Meeting 2

Approach

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   iii) push vs pull
   iv) manned participating in UAS technologies like Remote ID vs UAS participating in manned technologies like ADS-B
d) Summarize the above input into recommendations for possible future taskings & studies

➔ Sub-Group 2 (UPS, BNSF)
  - Explore existing technologies that can provide situational awareness to low altitude aviators (traditional aircraft, GA, gliders, unmanned)
    - For each technology/solution
      - What exists already vs needs to be developed/implemented further?
      - What information/value/function is provided by the solution?
      - How well does the solution address possible risks and collision hazards?
      - What and to whom are the costs associated?
      - What are the human factors implications?
  - Report back to Task Group 9

Task Group 9 - Meeting 2

Approach

Explore the "spirit" of the question:
Ways to further integrate manned and unmanned aviation using available and upcoming technologies & standards to enhance safety in the airspace.

This can help inform the FAA of possible future taskings and studies

a) Besides Remote ID what other information-sharing would be helpful between manned & unmanned (technology agnostic -- focus on the information)
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   i) voluntary vs required
   ii) realtime information vs historical or generalized
   iii) push vs pull
   iv) manned participating in UAS technologies like Remote ID vs UAS participating in manned technologies like ADS-B
d) Summarize the above input into recommendations for possible future taskings & studies

➔ Sub-Group 3 (Skyward, Dallas PD)
  - Identify areas outside of the scope of Task Group 9 that are important to consider with respect to situational awareness in low altitude airspace
    - How can information be better used to make the airspace safer?
    - Are there outstanding policy or regulatory discussions?
  - Report back to Task Group 9

Timing and Next Steps

- Please Reach out to Sub-Group Leads
  - Sub-Group 1
    - Chad Budreau | Academy of Model Aeronautics | chadb@modelaircraft.org
    - Chris Cooper | Aircraft Owners and Pilots Association | christopher.cooper@aopa.org
  - Sub-Group 2
    - Jarrod Knowlden | UPS | jknowlden@ups.com
    - Jennifer Player | BNSF | jplayer@avineer.com
  - Sup-Group 3
    - Sam Ewen | Skyward | sam.ewen@skyward.io
    - Mark Colborn | Dallas PD | kd5elf@tx.rr.com

- Sub-Group Reporting Process
  - Initial outline to Task Group 9 by December 22
  - Feedback to Sub-Group Leads and refinement
  - *Reactions to Remote ID rulemaking?*

- **Next meeting is Tuesday, January 12 at 1:00 ET**

DAC Task Group 9

Meeting 3

Agenda

- New Faces
- Remote ID Final Rule
- Revisiting the Tasking
- Sub-Group Updates
- Timing and Next Steps

New Faces

- Andy Thurling, NUAIR Alliance
- Ben Harrison, Wrapture Graphics
- Elias Bechara, Johns Hopkins University Applied Physics Laboratory
- Tony Nannini, Wing

Remote Identification Final Rule

This is a copy of the final rule that has been submitted to the Federal Register for publication.

BILLING CODE 4910-13-P

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 1, 11, 47, 48, 89, 91, and 107

[Docket No.: FAA-2019-1100; Amdt. Nos. 1-75, 11-63, 47-31, 48-3, 89-1, 91-361, and 107-7]

RIN 2120–AL31

Remote Identification of Unmanned Aircraft

AGENCY: Federal Aviation Administration (FAA), Department of Transportation (DOT).

ACTION: Final rule.

SUMMARY: This action requires the remote identification of unmanned aircraft. The remote identification of unmanned aircraft in the airspace of the United States will address safety, national security, and law enforcement concerns regarding the further integration of these aircraft into the airspace of the United States, laying a foundation for enabling greater operational capabilities.

DATES: *Effective dates:* Except for subpart C of part 89, this rule is effective [INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]. Subpart C of part 89 is effective INSERT DATE 60 DAYS AND 18 MONTHS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]. The incorporation by reference of certain publications listed in the rule is approved by the Director of the Federal Register as of [INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]. *Compliance dates:* Compliance with §§ 89.510 and 89.515 is required [INSERT DATE 60 DAYS AND 18 MONTHS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]. Compliance with §§ 89.105, 89.110, and 89.115, and subpart C of part 89 is

1

<u>**Major Changes from Proposed Rule to Final Rule**</u>

- Network-based / Internet transmission requirements have been eliminated. The final rule contains Broadcast-only requirements.
- Limited Remote ID UAS' has been eliminated and replaced with Remote ID Broadcast Module requirements to enable existing UA to comply.
- FRIA applications may be submitted to the FAA beginning 18 months after the effective date of the rule, and applications may be submitted at any time after that.

-- from FAA Executive Summary 12.28.20

Revisiting the Tasking

Tasking: DAC to engage operators in low altitude airspace to obtain feedback on how remote identification might be used to increase situational awareness and use this feedback to develop recommendations on how the FAA can address responses to the RFI.

Does this change the tasking from the FAA to the DAC?

Does this change our 'outreach strategy' Sub-Group (1)?

Do the required message elements or performance requirements in the final rule change surveyed 'technologies' Sub-Group (2)?

How can other technologies/approaches complement requirements in the final rule for 'beyond tasking' Sub-Group (3)?

Sub-Group 1

Review *available* RFI responses; develop survey to send to low altitude community; interview subject matter experts in industry, government, academia

Sub-Group 1 Report

Scope:

- To support recommendations on how the FAA can address responses to the RFI: collect, review, and summarize RFI responses (and engage with relevant stakeholders who did not respond) to determine how respondents believe remote identification can be used to increase situation awareness between manned aviation and UAS

Organizing and initial efforts:

- Obtain, review, and outline submitted RFI responses (approximately 80% are currently in our possession)
- Identify communities and stakeholders who did not submit responses to the RFI

Challenges:

- Finding missing stakeholders (i.e., gaps in expertise/knowledge)
- RFI author recommendations may have evolved and/or RFI does not align with final rule.
- Protecting/ overcoming proprietary information

Sub-Group 1 Forecast

What information are we looking for?

- RFI Responses
  - Focus on relative value
- Interviews
  - Probing for practical application of Remote ID data
- Additional Consideration
  - Did responses differ by use case or airspace?

Sub-Group 2

Explore existing technologies that can provide situational awareness to low altitude aviators (traditional aircraft, GA, gliders, unmanned)

Sub-Group 2 Report

Scope:

- Existing technologies that provide **situational awareness to low altitude aviators**
- Divide solutions into existing and emerging/needs bins

Next Steps:

- Compiling results on available and developing technologies
- Identifying feasible technologies that meeting Remote ID ruling

Challenges:

- Meeting the requirements of the FAA Remote ID ruling
- Determining burden of responsibility for situational awareness

Sub-Group 2 Forecast

What does it mean to implement?:

- Information categorized according to type of technology and the type of information that can be made available.
- Adoption costs must be clear.
- Frequency and range of information should be addressed.

EXAMPLE	Additional Equipment? (Y/N)	Data Protocol	Cost	Range
Onboard Sensor				
Mobile Device				
Surveillance				

Sub-Group 3

Identify areas outside of the scope of Task Group 9 that are important to consider with respect to situational awareness in low altitude airspace

Task Group 9 - Meeting 3

Sub-Group 3 Report

Subgroup 3 Leads:
- Mark Colborn
- Sam Ewen

Scope:

- Explore areas outside the explicit Tasking Group 9 problem statement relative to improving low altitude situational awareness for manned and unmanned aircraft. Safety and Regulations a focus.

Areas of Focus:

- Team has met three times and documented Objectives, Assumptions and Areas of focus:
  - UAS Intent and Action - benefits manned aviation: RID Broadcast data and active UAS ops into digital flight deck, Evaluate Notify and Fly for UAS and manned aircraft awareness, Secondary surveillance systems as a source of awareness, explore importance of rogue or uncooperative UAS identification.
  - Encouraging Participation - Benefits UAS: Encourage continued voluntary adoption of ADS-B out. Also consider utilizing FAASTeam.
  - UTM Considerations - Lack of Network Remote ID Final Rule has implications to UTM. Remote UAS Service Supplier (RSS) integration in the UTM.

Sub-Group 3 Report

Subgroup 3 Leads:
- Mark Colborn
- Sam Ewen

Next Steps:

- Review all RFI responses in concert with Sub-Group 1.
- Continue document and regulation research.
- Refine Areas of focus to recommendations.

Challenges:

- Time line, when is "pencils down"?
- How does final RID rule impact the mandate of the task group and Sub-Groups?

Sub-Group 3 Forecast

How can we maximize the value of data that is available or soon to be available for manned and unmanned pilots?

- Result may be a combination of overlying technologies satisfying information needs.
  - Data exchanges may be one-way or two-way
  - Technologies may be more appropriate in controlled or uncontrolled airspaces
- Additional airspace awareness information can be made available through other means.
  - "Strategic" information can be available for pilots before takeoff
  - FRIA or other limited airspace

Timing and Next Steps

- Please support our sub-group leads
  - Sub-Group 1
    - Chad Budreau | Academy of Model Aeronautics | chadb@modelaircraft.org
    - Chris Cooper | Aircraft Owners and Pilots Association | christopher.cooper@aopa.org
  - Sub-Group 2
    - Jarrod Knowlden | UPS | jknowlden@ups.com
    - Jennifer Player | BNSF | jplayer@avineer.com
  - Sup-Group 3
    - Sam Ewen | Skyward | sam.ewen@skyward.io
    - Mark Colborn | Dallas PD | kd5elf@tx.rr.com

- February DAC meeting
  - Wednesday, February 24
  - Interim report due

- **Next meeting is Tuesday, February 2 at 1:00 ET**

DAC Task Group 9

Meeting 4

Agenda

- Sub-Groups Update
- Revisiting the Task
- Next Steps

Sub-Group 1

Scope

- To support recommendations on how the FAA can address responses to the RFI: collect, review, and summarize RFI responses (and engage with relevant stakeholders who did not respond) to determine how respondents believe remote identification can be used to increase situation awareness between manned aviation and UAS.

Progress

- Six Sub-Group 1 plenary meetings to acquire and review 21 of 30 received RFIs.
- Teams established and meeting to identify trends, commonalities, and gaps among the RFIs. Teams divided into commercial/recreational operators, public operators, manufacturers, and service providers.
- Beginning to identify other stakeholders to engage outside of the RFI authors.

Task Group 9 - Meeting 4

Sub-Group 1

Early Findings
- Seeing an early trend requesting that RID incorporate/integrate into existing manned aviation technologies.
- There is a lack of unmanned perspective in the RFIs.
- Some RFIs do not align with the Final Rule (a few presumed RID will include a network solution).

Next Steps
- Continue our deep dive analysis of the RFIs.
- Identify other stakeholders to engage.
- Begin acquiring additional information through focus groups and surveys.

Task Group 9 - Meeting 4

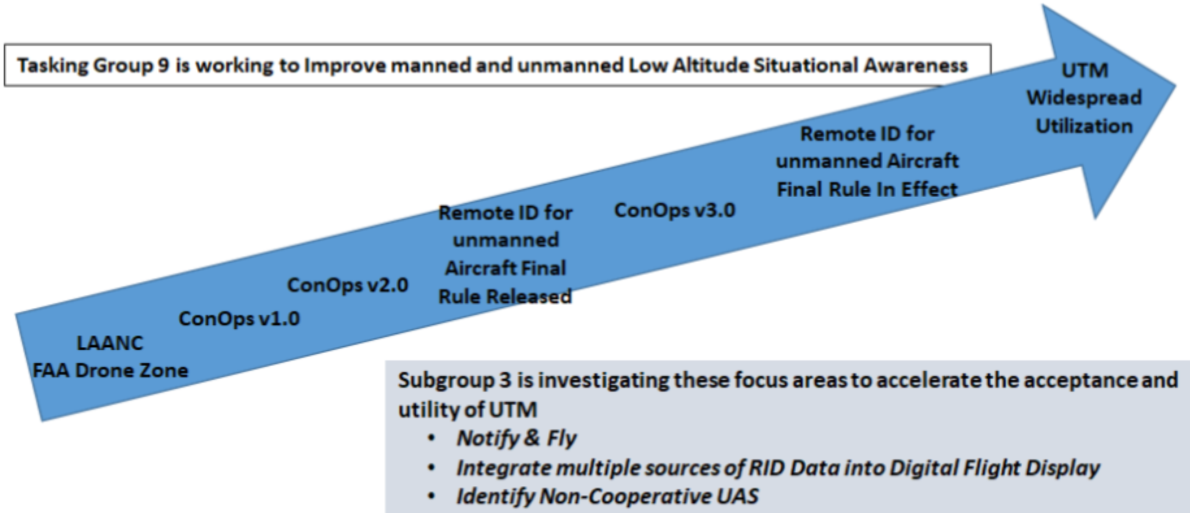
Sub-Group 2 Report

Updates:

- Several meetings convened to populate technologies matrix, including:
  - ADS-B
  - Transponder
  - Detect and Avoid
  - UAS Remote Identification
  - Vehicle 2 Vehicle
  - ‘Other’
- Explores applicability to manned and unmanned aircraft and range.
- Efforts underway to capture human factors and cost.
- Challenges:
  - Looking for subject matter experts to volunteer expertise in completing table
  - Readying for Interim Report to DAC

Task Group 9 - Meeting 4

Sub-Group 3



Task Group 9 - Meeting 4

Revisiting the Task

DAC to engage operators in low altitude airspace to obtain feedback on how remote identification might be used to increase situational awareness and use this feedback to develop recommendations on how the FAA can address responses to the RFI.

- Assembly of broad cross-section of low altitude aviators ✅
- Survey of available and developing situational awareness methodologies and technologies ✅

- Continue to be mindful of usefulness to the pilot (manned and unmanned) and impacts to airspace safety.
- How do we turn this info into recommendations?

Timing and Next Steps

- Matt to meet with FAA to discuss Final Remote ID Rule and Task Group 9.

- DAC Meeting Wednesday, February 24
  - Interim Report provided by James Ryan Burgess and sub-group leads.
  - Slides to be shared with Task Group 9 by Friday February 5 for comment.

- Post DAC Meeting
  - Plan to finish interviews and data collection
  - Draft and finish Report to DAC

- **Next meeting is Tuesday, March 2 at 1:00 ET**

DAC Task Group 9

February 24 Update

Federal Aviation Administration

DRONE ADVISORY COMMITTEE
October 22, 2020

DAC Tasking

Opportunity: Can Remote ID be used to increase situational awareness between manned aviation that routinely operates at low altitudes away from airports and UAS operating in the same airspace?

Tasking: DAC to engage operators in low altitude airspace to obtain feedback on how remote identification might be used to increase situational awareness and use this feedback to develop recommendations on how the FAA can address responses to the RFI.

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Task Group 9 - Update

Dissecting the Problem Statement

- Follow the direction set by the FAA.
  - Voluntary participation in Remote ID for low-altitude manned operators.
- Explore the spirit of the problem.
  - Explore existing technologies that can provide situational awareness to low-altitude aviators (traditional aircraft, GA, gliders, unmanned).
- What else do we know or need to investigate?
  - Identify areas outside of the scope of Task Group 9 that are important to consider with respect to situational awareness in low-altitude airspace.

Task Group 9 - Update

Dissecting the Problem Statement

- Sub-Group 1 (AMA, AOPA)
  - Review *available* RFI responses; develop survey to send to low-altitude community; interview subject matter experts in industry, government, academia.
- Explore the spirit of the problem.
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- What else do we know or need to investigate?
  - Identify areas outside of the scope of Task Group 9 that are important to consider with respect to situational awareness in low-altitude airspace.

Task Group 9 - Update

Dissecting the Problem Statement

- Sub-Group 1 (AMA, AOPA)
  - Review *available* RFI responses; develop survey to send to low-altitude community; interview subject matter experts in industry, government, academia.
- Sub-Group 2 (BNSF, UPS)
  - Explore the applicability of existing/developing technologies to manned and unmanned aircraft including range, human factors, and cost.
- What else do we know or need to investigate?
  - Identify areas outside of the scope of Task Group 9 that are important to consider with respect to situational awareness in low-altitude airspace.

Dissecting the Problem Statement

- Sub-Group 1 (AMA, AOPA)
  - Review *available* RFI responses; develop survey to send to low-altitude community; interview subject matter experts in industry, government, academia.
- Sub-Group 2 (BNSF, UPS)
  - Explore the applicability of existing/developing technologies to manned and unmanned aircraft including range, human factors, and cost.
- Sub-Group 3 (Dallas PD, Skyward)
  - Expectations for manned aircraft information and behavior are well-known in most airspace environments and increases in capability as regulations/standards are developed for unmanned aircraft.

Understanding the Feedback

- Sub-Group 1 (AMA, AOPA)
  - Review *available* RFI responses; develop survey to send to low-altitude community; interview subject matter experts in industry, government, academia

- Responses consider sharing remote identification information to aviators in low-altitude airspace through existing FAA-supported infrastructure.
- Responses also consider the safety and human factors implications of displayed remote identification information.
- Further outreach to underrepresented stakeholders and subject matter experts.

Understanding the Technical Landscape

- ➔ Sub-Group 2 (UPS, BNSF)
  - ◆ Explore existing technologies that can provide situational awareness to low-altitude aviators (traditional aircraft, GA, gliders, unmanned)

	Installation	Data Provided	Range	Display	Cost
ADS-B	Installed on (manned) aircraft	In-flight data	~55 km max range	Instrument Panel, EFB	TBD
Transponder	Installed on aircraft	Pre-flight, In-flight data	~55 km	Instrument Panel, EFB	TBD
Detect and Avoid	Ground or airborne sensors	In-flight data	~3 - 30 km	Instrument Panel, EFB	TBD
UAS Remote Identification	Installed on unmanned aircraft	In-flight data	~1 - 2 km	Instrument Panel, EFB, USS, URL	TBD
Vehicle 2 Vehicle	Airborne sensors	Pre-flight, In-flight data	~10 km	Instrument Panel, EFB, USS, URL	TBD
Other	E.g., NOTAM, RF	Pre-flight, In-flight data		Instrument Panel, EFB, USS, URL	TBD

Understanding the Airspace

- ➔ Sub-Group 3 (Skyward, Dallas PD)
  - ◆ Identify areas outside of the scope of Task Group 9 that are important to consider with respect to situational awareness in low-altitude airspace

- Given UAS use cases & conops in low-altitude airspace, what situational awareness is needed, and what solutions may already exist?

- What is in development (i.e., future UTM ConOps), and how can we maximize effectiveness while avoiding mandates?
  - Information flows - Notify & Fly
  - Data sources - integrating multiple sources of data (i.e., RemoteID and other sources) to provide better situational awareness
  - Consider mechanisms to identify both cooperative and non-cooperative

Plan for Completion

DAC to engage operators in low altitude airspace to obtain feedback on how remote identification might be used to increase situational awareness. Use this feedback to develop recommendations on how the FAA can address responses to the RFI.

- Assembly of broad cross-section of low altitude aviators ✅
- Survey of available and developing situational awareness methodologies and technologies ✅

- Continue to be mindful of usefulness to the pilot (manned and unmanned) and impacts to airspace safety.
- Craft recommendations.
  - Identify applicability of remote identification information to situational awareness
  - Suggest future tasking(s) that may augment this topic

DAC Task Group 9

Meeting 5

Task Group 9 - Meeting 5

Agenda

- DAC Interim Update
- Discussion
- Next Steps

Task Group 9 - Meeting 5

Understanding the Feedback

→ Sub-Group 1 (AMA, AOPA)
  - Review *available* RFI responses; develop survey to send to low-altitude community; interview subject matter experts in industry, government, academia

- Responses consider sharing remote identification information to aviators in low-altitude airspace through existing FAA-supported infrastructure.

- Responses also consider the safety and human factors implications of displayed remote identification information.

- Further outreach to underrepresented stakeholders and subject matter experts.

Understanding the Technical Landscape

- ➔ Sub-Group 2 (UPS, BNSF)
  - ◆ Explore existing technologies that can provide situational awareness to low-altitude aviators (traditional aircraft, GA, gliders, unmanned)

	Installation	Data Provided	Range	Display	Cost
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UAS Remote Identification	Installed on unmanned aircraft	In-flight data	~1 - 2 km	Instrument Panel, EFB, USS, URL	TBD
Vehicle 2 Vehicle	Airborne sensors	Pre-flight, In-flight data	~10 km	Instrument Panel, EFB, USS, URL	TBD
Other	E.g., NOTAM, RF	Pre-flight, In-flight data		Instrument Panel, EFB, USS, URL	TBD

Understanding the Airspace

- ➔ Sub-Group 3 (Skyward, Dallas PD)
  - ◆ Identify areas outside of the scope of Task Group 9 that are important to consider with respect to situational awareness in low-altitude airspace

- Given UAS use cases & conops in low-altitude airspace, what situational awareness is needed, and what solutions may already exist?

- What is in development (i.e., future UTM ConOps), and how can we maximize effectiveness while avoiding mandates?
  - Information flows - Notify & Fly
  - Data sources - integrating multiple sources of data (i.e., RemoteID and other sources) to provide better situational awareness
  - Consider mechanisms to identify both cooperative and non-cooperative

Plan for Completion

DAC to engage operators in low altitude airspace to obtain feedback on how remote identification might be used to increase situational awareness. Use this feedback to develop recommendations on how the FAA can address responses to the RFI.

- Assembly of broad cross-section of low altitude aviators ✅
- Survey of available and developing situational awareness methodologies and technologies ✅

- Continue to be mindful of usefulness to the pilot (manned and unmanned) and impacts to airspace safety.
- Craft recommendations.
  - Identify applicability of remote identification information to situational awareness
  - Suggest future tasking(s) that may augment this topic

Discussion

Timing and Next Steps

- Next full DAC meeting to be mid-June.
  - Task Group 9 to present completed work
  - Begin drafting report and recommendations by mid-May

- **Next meeting is Tuesday, March 23 at 1:00 ET**

DAC Task Group 9

Meeting 6

Agenda

- Sub-Group Updates
- Open Discussion
- Next Steps

Task Group 9 - Meeting 6

Sub-Group 1

Sub-Group 2

Task Group 9 - Meeting 6

Sub-Group 3

Discussion

Timing and Next Steps

- Next full DAC meeting to be mid-June.
  - Task Group 9 to present completed work
  - Begin drafting report and recommendations by mid-May

- **Next meeting is Tuesday, April 13 at 1:00 ET**

DAC Task Group 9

Meeting 7

Agenda

- Sub-Group Updates
- Open Discussion
- Next Steps

Sub-Group 1 Update

Surveys Released:

- Survey 1 extended to piloted aircraft community soliciting input on the utility of Remote ID information in the cockpit.
- Survey 2 extended to UAS community asking for their impressions on supplying or supporting the use of Remote ID information for use in the cockpit.

Deadline:

- We've asked that survey responses be completed by April 15.

Ahead:

- Organize responses, identify patterns.
- Begin draft.

Sub-Group 2 Update

Technology Matrix Updated:

- Matrix reorganized into two sections:
  - UAS Operators to be made aware of piloted aircraft.
  - Piloted aircraft to be made aware of UA.

Review:

- Please take the time to review and comment (if necessary).

Ahead:

- Finalize matrix.
- Identify technology overlaps and gaps.
- Begin draft.

Sub-Group 3 Update

Recommendations Crystalizing:

- Group has discussed give recommendations to the FAA which could improve situational awareness in the piloted and UAS communities.
  - ADS-B In Use by Remote Pilots
  - Radio Use by Remote Pilots
  - Voluntary Onboard Equipment for Low Altitude Aviators
  - Notify & Fly
  - Ground Based RID-In Detection Network

Ahead:

- Finalize recommendations.
- Continue narrative / draft.

Discussion

Timing and Next Steps

- Next full DAC meeting to be mid-June.
  - Task Group 9 to present completed work
  - Begin drafting report and recommendations by mid-May

- **Next meeting is Tuesday, May 11 at 1:00 ET**

DAC Task Group 9

Meeting 8

Agenda

- Sub-Group 1 and 3 Updates
- Next Steps
- Open Discussion

Sub-Group 1 Update

Surveys Collected:

- Over 300 responses across 30+ organizations have responded to the piloted aircraft survey.
- An additional 19 responses were received from the "UAS" community.

What Do We Know:

- FAA should explore human factors and related safety considerations as they related to accessing remote identification information.
- FAA should determine appropriate filtering techniques related to access.
- Accessing remote identification should be voluntary and leverage existing aviation technologies and infrastructure.
- FAA should design and education campaign around accessing remote identification.

Sub-Group 3 Update

What do we recommend:

- FAA should encourage UAS Operators, developers, and manufacturers, to implement and use ADS-B In technologies.
- FAA should update the policy to allow the UAS Operator to monitor ATC frequencies when operating in controlled airspace including Class E.
- FAA should develop an acceptance and/or certification path for on-board remote identification monitoring capability for manned aircraft.
- FAA should consider a Notify & Fly program.
- FAA should explore ways for broadcast remote identification to transmitted to UTM, TIS-B, or other mechanisms.

Timing and Next Steps

- Next full DAC meeting to be June.
  - Task Group 9 to present completed work

- **DRAFT due to FAA May 28!**

Discussion

OVERVIEW

DAC TASK GROUP 10 Gender-Neutral Language for the Drone Community

DAC Meeting, June 23, 2021

At the February 24, 2021, meeting of the Federal Aviation Administration's (FAA) Drone Advisory Committee (DAC), the designated federal officer established Task Group #10 (TG-10). Subsequently, Patricia Gilbert, Executive Vice President of the National Air Traffic Controllers Association (NATCA), and Mark Baker, President of the Aircraft Owners and Pilots Association (AOPA), were asked and agreed to co-chair the task group.

Tasking:

1. The DAC to develop recommendations for gender-neutral language as an alternative to gender-specific terms currently used in the drone industry and aviation community.
2. The DAC to take the lead to facilitate the adoption of gender-neutral language throughout the drone community and provide recommendations that organizations across the industry and community can implement.

Task Group: The DAC and the Operations/Technology subcommittee members from 17 organizations — representing labor, airports, local government, providers, traditional aviation, hardware, software and drone manufacturers, and advanced air mobility — joined our tasking. The task group commenced work on March 10, 2021, via the first of many virtual meetings held by subgroups, subgroup leads, and the full task group. The diverse backgrounds, passion for the subject, expertise, experience, and strong work ethic each member brought to the work was critically important. As members tackled the research, writing, and complexity of the task, over and over again, all agreed that our recommendations and the subsequent work of the FAA and the drone community will be essential for modeling the leadership and behaviors that will build a more inclusive aviation community.

I. INTRODUCTION

> *As you all know, infrastructure is also jobs.*
>
> *A big part of my job here at the FAA is to make sure we get the infrastructure support that we need, as well as to remove any barriers from recruiting the next generation of aerospace workers who will operate that infrastructure.*
>
> *We want the best, brightest, and most diverse group of people from all walks of life, and I look forward to working with everyone here to make sure that we*

recruit more women, minorities, and people from underserved communities for the aerospace workforce.

With this workforce and major investments in aviation infrastructure, our aerospace system can be greener, will continue to fuel the U.S. and world economies, and once again bring people, cultures, and ideas closer together.

— **A. Bradley Mims, Federal Aviation Administration Deputy Administrator**
"Building the Foundation for Aviation's Future"
March 31, 2021[1]

As Deputy Administrator Mims indicated earlier this year, removing barriers is a key element to ensuring that top talent, from all walks of life, both individuals and organizations, is attracted to aviation as an exemplary industry with transformational leaders, determined decision makers, and diverse and highly engaged professionals.

Regardless of the perception that "progress has been made," the data shows that we continue to have a gap of women and underrepresented groups in aviation; increases in their participation over the past 15 years have been negligible.

We are uniquely positioned to do something different as the drone industry becomes a full partner in aviation. Adopting gender-neutral language is a positive step toward a more inclusive and diverse ecosystem. Diversity remains a critical building block to unleashing innovation, and a culture of equality is an essential multiplier to help maximize innovation. While diversity factors alone have a significant impact on the innovation mindset, it is much higher when combined with a culture of equality. A metastudy across multiple industries found that in companies with the most-equal and diverse cultures, an innovation mindset is 11 times greater than in the least-equal and diverse cultures.[2]

A robust safety culture is reliant on the participation of those expected to use it. Its success depends on three things: its scope, whether employees are knowledgeable about it, and whether they are well disposed towards it, i.e., committed to making it work.

DAC Task Group 8 - Safety Culture:
Guiding principles, or tenets, that are considered common and foundational in strong safety cultures:

- Safety ownership

[1] Mims, A. Bradley. "Building the Foundation for Aviation's Future." 31 Mar. 2021. U.S. Chamber of Commerce Aviation Summit (Virtual), Federal Aviation Administration, https://www.faa.gov/news/speeches/news_story.cfm?newsId=25981. Transcript.

[2] "Equality=Innovation: Getting to Equal 2019: Creating a culture that drives innovation." Accenture, 2019. https://www.accenture.com/_acnmedia/Thought-Leadership-Assets/PDF/Accenture-Equality-Equals-Innovation-Gender-Equality-Research-Report-IWD-2019.pdf. Accessed 14 May 2021.

- Safety modeled by leadership
- Organizational values
- Learning culture
- Systemwide approach
- Trust

These are all tenets which rely on a valued, confident, and engaged community and workforce. In fact, strategies for reducing accidents and incidents in aviation due to complex human behaviors have been widely adopted in flight training with Crew Resource Management (CRM) and subsequently with air traffic services in Team Resource Management and more recently Maintenance Resource Management.

As explained on SKYbrary, "CRM is concerned not so much with the technical knowledge and skills required to fly and operate an aircraft but rather with the cognitive and interpersonal skills needed to manage the flight within an organised aviation system. In this context, **cognitive skills are defined as the mental processes used for gaining and maintaining situational awareness, for solving problems and for making decisions**. **Interpersonal skills are regarded as communications and a range of behavioural activities associated with teamwork.** In aviation, as in other walks of life, these skill areas often overlap with each other, and they also overlap with the required technical skills. Furthermore, they are not confined to multi-crew aircraft, but also relate to single pilot operations, which invariably need to interface with other aircraft and with various ground support agencies in order to complete their missions successfully."[3]

One of the most notable examples of an outcome in which these principles were applied is ‘‘the Miracle on the Hudson.’’ On January 15, 2009, an Airbus A320 ditched into the Hudson River after suffering double engine failure due to multiple bird strikes shortly after takeoff. All passengers and crew survived, largely thanks to exceptional resource management on the part of the flight deck, cabin crew, and first responders. In his foreword to *Crew Resource Management*, John K. Lauber writes that "the fortunate outcome of this event represents the confluence of many factors, but it is very clear that none of those would have made much of a difference had the flight crew not executed a successful ditching, and, subsequently and in close concert with the cabin crew, evacuated all 155 persons on the aircraft. This accident seems to represent the highest form of human performance — CRM at its very best."[4]

Potentially harmful actions, terminology, and behaviors, while sometimes subtle, nevertheless undercut efforts to create a more inclusive, safe, and productive ecosystem. As suggested by the name, microaggressions seem small; but compounded over time, they can have a deleterious impact on an employee's experience, physical health, and psychological well-being.

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[3] "Crew Resource Management (CRM)." SKYbrary, 21 Mar 2020. https://www.skybrary.aero/index.php/Crew_Resource_Management_(CRM). Last accessed 14 May 2021.

[4] Lauber, John K. "Foreword." *Crew Resource Management*. Kanki, Bargara G, Robert L. Helmreich, et al. (eds). Academic Press, 2010.

In fact, research suggests that subtle forms of interpersonal discrimination like microaggressions are *at least as harmful* as more-overt expressions of discrimination.[5]

A March 2021 presentation from the National Business Aviation Association (NBAA) Leadership Summit focused on diversity, equity, and inclusion (DEI) in the workplace, with a specific focus on overall safety benefits. It posited that a more inclusive and comfortable work environment is one that leads to creation of a stronger ecosystem that lends itself to removing barriers when producing operating policies and procedures. Diverse viewpoints only add to any discussion relative to risk and overall safety. On the other hand, subconscious implicit biases enable an atmosphere of "microaggressions" that are detrimental to safety in the workplace, whether in an office or on flight deck. Consultant Jim Peal, one of the presenters at the conference, noted, "When microaggressions happen – whether they are intentionally meant to hurt or not – our attention goes inside and we stop paying attention to the outside, and this can impact safety."[6]

Diversity and inclusion are much more than a legal or moral initiative; they enhance safety and as indicated above are "a critical building block for unleashing innovation," which gives educational institutes, government, companies, organizations, and labor unions a competitive advantage.[7]

A 2019 analysis conducted by McKinsey found that "companies in the top quartile of gender diversity on executive teams were 25 percent more likely to experience above-average profitability than peer companies in the fourth quartile. This is up from 21 percent in 2017 and 15 percent in 2014."[8]

For all these reasons, we recommend that the Federal Aviation Administration move to adopt gender-neutral language in the drone industry. To ensure inclusion of all regardless of gender identity, and to avoid burdensome language, we recommend utilizing gender-neutral language (e.g., "person"; "they") rather than gender-binary (e.g., "man or woman"; "he or she").

From a practical perspective, the tasking group believes changes to adopt gender-neutral language should take on two priorities: First, all new documents, speeches, social media, and marketing and promotional material should use gender-neutral language. Second, rework of

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[5] Jones, Kristen P., et al. "Not So Subtle: A Meta-Analytic Investigation of the Correlates of Subtle and Overt Discrimination." Journal of Management, vol. 42, no. 6, Sept. 2016, pp. 1588–1613, doi:10.1177/0149206313506466.

[6]Leadership Summit – DEI Benefits in the Workplace," March 25, 2021, available at https://nbaa.org/professional-development/on-demand-education/nbaa-go/leadership-summit/nbaa-go-leadership-summit-newsroom/leadership-summit-dei-benefits-the-workplace/

[7] ibid

[8] Dixon-Fyle, S., Hunt, V., Dolan, K., and Prince, S. "Diversity wins: How inclusion matters." McKinsey & Company, 2020. https://www.mckinsey.com/~/media/mckinsey/featured%20insights/diversity%20and%20inclusion/diversity%20wins%20how%20inclusion%20matters/diversity-wins-how-inclusion-matters-vf.pdf. Last accessed 14 May 2021.

existing documents and materials should be prioritized by the number of individuals exposed to the material, as well as the effort required to update them.

II. Tasking & Recommendation Overview

History of Drone Naming Conventions in the U.S. and Internationally

Before turning to why we believe it is important to change the current language integrating the U.S. drone industry, it is helpful to review how some of the terminology was adopted. At the outset, it is worth noting that this nomenclature is still recent and evolving and therefore should not be viewed as sacrosanct or traditional.

The FAA's first public usage of "UAS" (unmanned aircraft systems) appeared on February 6, 2007, in the FAA's Federal Register Notice "Unmanned Aircraft Operations in the National Airspace System" (Docket No. FAA-2006-25714). This notice clarified the FAA's then-current policy concerning operations of unmanned aircraft in the National Airspace System. Further research reveals that perhaps the first notable, regulatory usage of UAS came about on August 4, 2005, in a U.S. Military Memorandum with the subject title "Unmanned Aircraft Systems (UAS) Roadmap, 2005-2030."

The first U.S. statutory reference to UAS came in the FAA Modernization and Reform Act of 2012, PUBLIC LAW 112-95 (Feb. 14, 2012). Subtitle B of this law attempted to introduce, regulate, and begin the foundation for the integration of drones. Section 313 set forth the following definitions, among others:

> **Small Unmanned Aircraft—The term ''small unmanned aircraft'' means an unmanned aircraft weighing less than 55 pounds.**
>
> **Unmanned Aircraft—The term ''unmanned aircraft'' means an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.**
>
> **Unmanned Aircraft System—The term ''unmanned aircraft system'' means an unmanned aircraft and associated elements (including communication links and the components that control the unmanned aircraft) that are required for the pilot in command to operate safely and efficiently.**

However, the actual history of unmanned aircraft (UA), UAS, remotely piloted aircraft systems (RPAS), or drones, more than likely exceeds 50 years. The term *drone* may have been used first to describe early military targets being towed behind an aircraft for target practice. Later, military drone aircraft were flown remotely as evasive targets for military training exercises. By the early 2000s armed military drones or unmanned aircraft were used in the Middle East for intelligence, surveillance, and reconnaissance (ISR) and to conduct air-to-ground military engagements.[9] Over the next several years the FAA borrowed concepts of operations and terminology from Department of Defense (DOD) operational documents describing UAS or drones' interaction with air traffic control (ATC).[10] Currently, the FAA and industry efforts to integrate civil UAS into the National Airspace System (NAS) include numerous terms for aircraft systems without a pilot on board. Today, the FAA regularly intermixes the terms *unmanned aircraft system* and *drone* in many of its publications and on websites, but the term *drone* is not included or defined in the Code of Federal Regulations (CFR) governing unmanned aircraft in the NAS.

Internationally, the International Civil Aviation Organization (ICAO) Air Navigation Commission, at its 175th Session on 19 April 2007, approved the establishment of the Unmanned Aircraft Systems Study Group (UASSG). The UASSG first considered introducing the term "remotely piloted" at its third meeting, 15 to 18 September 2009, after reaching the conclusion that only unmanned aircraft that are remotely piloted could be integrated alongside manned aircraft in non-segregated airspace and at aerodromes. The study group therefore decided to narrow its focus from all UAS to those that are remotely piloted. The UASSG developed the *Unmanned Aircraft Systems (UAS)* (Cir328), published in March 2011. The circular provided States with an overview of issues that would have to be addressed in the Annexes to ensure remotely piloted aircraft systems (RPAS) would be compliant with the provisions of the Chicago Convention. The UASSG then turned its attention to the development of the first edition of the Manual on Remotely Piloted Aircraft Systems (RPAS) Doc 10019, published 2015, which replaced Cir328. Both publications stated, "[T]he goal of ICAO in addressing unmanned aviation is to provide the fundamental international regulatory framework through SARPs."[11] Autonomous uncrewed aircraft are not within the scope of Doc 10019.

Doc 10019 defines an Remotely Piloted Aircraft (RPA) as an unmanned aircraft that is piloted from a remote pilot station. Additionally, it is important to note that RPAS is addressed by ICAO as one subset of UAS.[12] In March 2012, the first significant package of Standards and Recommended Practices (SARPS) related to RPAS was adopted for Annex 2 — *Rules of the Air* and Annex 7 — *Aircraft Nationality and Registration Marks*.

[9] Bowden, Mark. "How the Predator Drone Changed the Character of War." *Smithsonian Magazine*, Nov 2013. https://www.smithsonianmag.com/history/how-the-predator-drone-changed-the-character-of-war-3794671/. Last accessed 15 May 2021.

[10] Walker, J and Geiselhart, K. March 2007 RTCA Program Management Committee approved Special Committee 203 (SC-203) DO-304 Guidance material and Considerations for Unmanned Aircraft System.http://www.uasresearch.com/documents/yearbook/066-67_Contributing-Stakeholder_RTCA.pdf. Last accessed 17 May 2021.

[11] International Civil Aviation Organization. Manual on Remotely Piloted Aircraft Systems (RPAS), Doc 10019. ICAO, 2015. https://skybrary.aero/bookshelf/books/4053.pdf. Last accessed 14 May 2021.

[12] Ibid

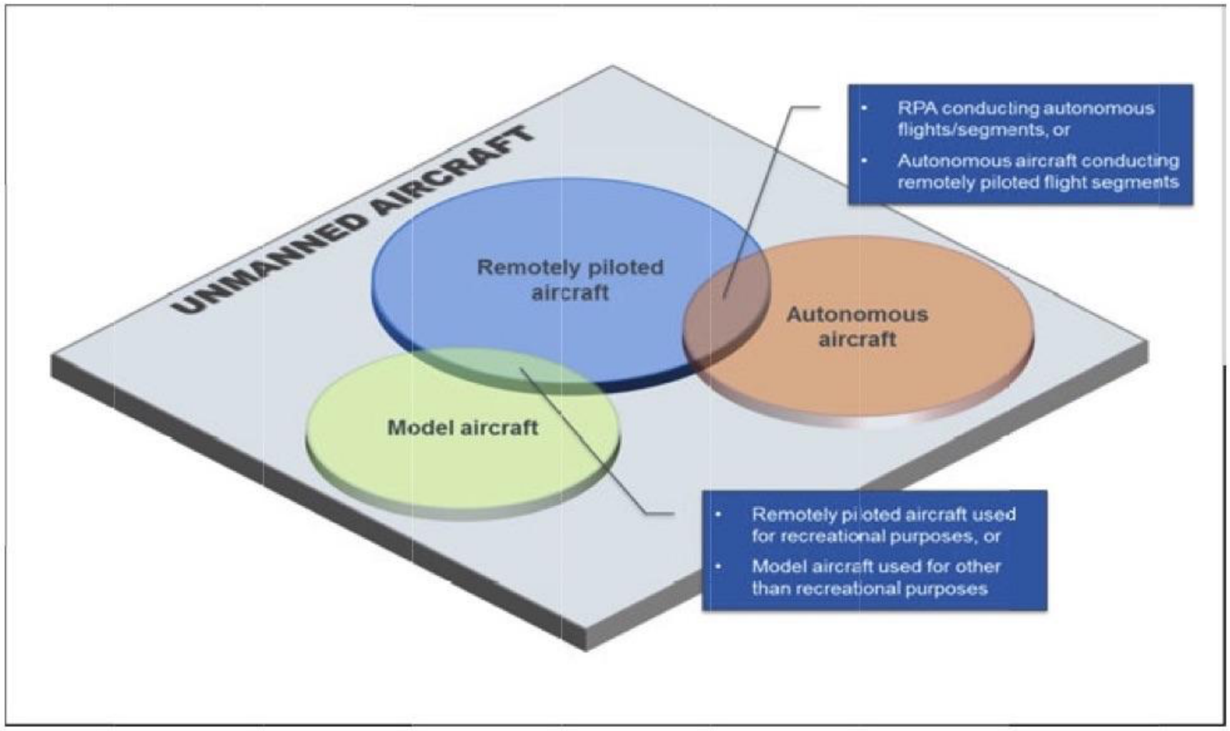


Figure 1-1. Unmanned aircraft

In 2018, Canada announced at an ICAO Conference its decision to use the term RPAS for "legal and regulatory purposes."[13]

Even within the United States, the utilization of the term *unmanned* has not been universal. To the contrary, NASA's History Program Office Style Guide, adopted on January 24, 2006, states: "All references referring to the space program should be non-gender specific (e.g. human, piloted, un-piloted, robotic)."[14]

Important Dates:

- 8/4/2005 – DOD publishes Memorandum "Unmanned Aircraft Systems (UAS) Roadmap, 2005-2030"
- 1/24/2006 – NASA establishes that all references referring to the space program should be non-gender specific (e.g. human, piloted, un-piloted, robotic). (Style Guide for NASA History Authors and Editors)

[13] Working Paper: THIRTEENTH AIR NAVIGATION CONFERENCE Montréal, Canada, 9 to 19 October 2018. ICAO, 2018. https://www.icao.int/Meetings/anconf13/Documents/WP/wp_304_en.pdf. Last accessed 17 May 2021.

[14] Style Guide for NASA History Editors and Authors. NASA, 2012. https://history.nasa.gov/styleguide.html. Last accessed 15 May 2021.

- 2/6/2007 – FAA refers to UAS in its Federal Register Notice “Unmanned Aircraft Operations in the National Airspace System”(Docket No. FAA-2006-25714).
- 2/14/2012 – Public Law 12-95 “UAS” first congressional reference.
- 10/19/2018 – Canada announces at an ICAO Conference a decision to utilize the term RPAS for “legal and regulatory purposes.”

Some have posited that the term *unmanned* is not gendered but rather meant to be universal by referring to all humans. However, as will be detailed below, studies have shown that such terms are interpreted as gendered and can lead to feelings of exclusion and gender stereotyping. Having set this stage for how drone nomenclature has evolved, we now turn to the rationale for progressing to gender-neutral language in this space. While the task group provided guidance on replacement terms, it did not undertake the development of definitions of specific recommendations for gender-neutral language because it was deemed to be out of scope for this task group.

III. Recommendations

Use gender-neutral language (rather than gender-binary language) wherever possible

Rebecca S. Bigler of the University of Texas at Austin and Campbell Leaper of the University of California, Santa Cruz, analyzed a number of studies to determine the impact of language on children’s understanding of gender. Ultimately, they found that: “The neutral terms are preferred over masculine and feminine forms because they do not impose a gender binary, make the gender of workers salient, or lead to narrow, gender exclusionary conceptions of occupations.”[15]

The European Parliament has embraced neutral language and discourages utilization of binary options, and airlines similarly have moved away from binary options like “ladies and gentlemen.”

Recommendation 1: The Federal Aviation Administration should adopt gender-neutral language in the drone industry. To ensure inclusion of all regardless of sex, gender expression, gender identity, and to avoid burdensome language, we recommend using gender-neutral language (e.g., “person”; “they”) rather than gender-binary (e.g., “man or woman”; “he or she”). See style guide below.

[15] Rebecca S. Bigler and Campbell Leaper, “Gendered Language: Psychological Principles, Evolving Practices, and Inclusive Policies,” Behavioral and Brain Sciences, 2015, Vol. 2(1) 187 –194, at 191.

Recommendation 2:

A. Due to the advantage of maintaining the use of a "U" in acronyms, which minimizes renaming disruption in both FAA and other groups, "unmanned" should be replaced with "uncrewed," at least in the short term. If the FAA determines that a two-phase approach is too cumbersome, we suggest replacing *unmanned* with *drone* immediately, as the ideal long-term solution — see recommendation 2 (B) below.
B. *Drone* is recommended as optimal for long-term use. It is a useful word that encompasses all of the various flight and control modes (from remotely piloted to highly automated) and aircraft types that currently fall under the category of “unmanned.”
C. Consider working with Congress on a revised definition of “UAS” that more accurately describes these aircraft systems.

Recommendation 3: From a practical perspective, changes to adopt gender-neutral language should take on two priorities:

A. All new documents, speeches, social media, and marketing and promotional material should use gender-neutral language.
B. Rework of existing documents and materials should be prioritized by the number of individuals exposed to the material, as well as the effort required to update them.

Recommendation 4: Expand beyond drones to aviation more broadly. Both the problem we are trying to solve and the benefits of making this change apply to the entire aviation industry – not just to the drone industry. Of course, language outside of the drone industry may be more entrenched given the comparative maturity of the rest of the industry, but that also means that there is a potential for even greater benefits. Furthermore, those within the drone industry naturally will need to interface with the broader aviation industry.

The Fire Department of New York City (FDNY) shared its experience in adopting gender-neutral language with the DAC TG#10.

> “With the success of hiring more women into FDNY, the FDNY agreed it was important to embrace inclusive language.
>
> The Fire Department of New York City (FDNY) created an initiative to move to gender neutral language and concluding with the adoption of City Ordinance. The FDNY gathered a task force of individuals from a variety of disciplines across the ranks of FDNY and documented a comprehensive list of gendered language found in FDNY documents. The task force then proposed gender neutral replacements for gender specific language and reviewed the proposal within the Department including the FDNY Equity Officer. A one-page document was then created for use by FDNY members as well as a template to update existing documents. Finally, the proposal was adopted by the City Council.

Thanks to constant reinforcement of the importance of adopting gender neutral language by FDNY senior officers, a shift in language is happening.

The most significant lesson we learned in making this transition is to realize this is a cultural change for people and it is normal for most everyone to resist it. Patience and perseverance were the keys to our success."

The Federal Aviation Administration has a similar opportunity to embrace gender-neutral language and create a more inclusive environment.

FAA Gender-free Style Guide Recommendations

Prepared by the Drone Advisory Committee Task Group 10

June 2021

Contents

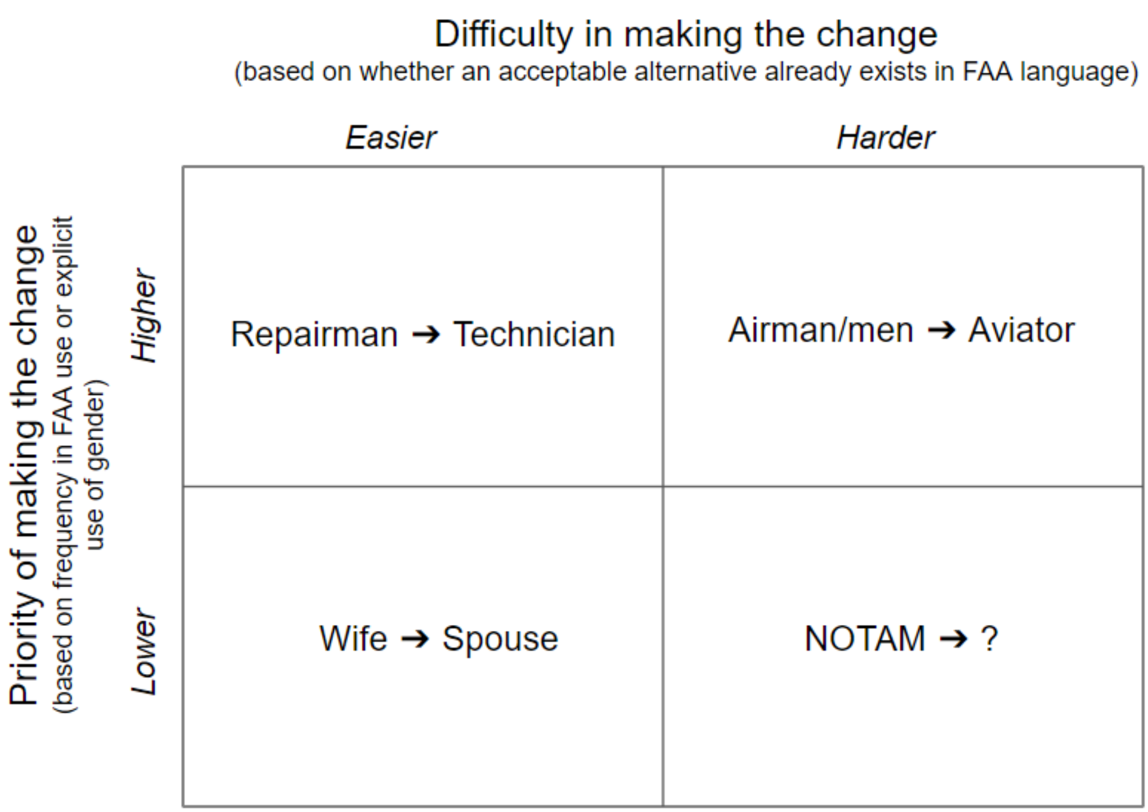
Overview

The FAA Drone Advisory Committee (DAC), the agency's industry advisory board, has been tasked to develop recommendations for gender-neutral language as an alternative to gender-specific terms currently used in the drone industry and aviation community. The following reflect these recommendations, which should be seen as a starting point for a more thorough FAA internal review and policy-making process.

The primary reason for these recommended changes is to make aviation more inclusive by reducing or eliminating language that reflects intentional or unintentional bias; many of the terms are historical and stem from an earlier era of aviation. We focused mainly on gender bias, particularly on language that derived from what was once a male-dominated industry. But we also reflected a more modern recognition that gender can be non-binary and that personal preferences should be respected whenever possible.

We hope that the FAA will incorporate these changes in its official language policies and style guides, initially in the drone sector but eventually extending throughout the FAA. That said, we primarily limited ourselves to terminology about and around drones *per se*, and did not do a systematic review of terminology in traditional commercial and general aviation.

We considered both the priority of word changes and the difficulty in making them, and roughly batched them as follows, with examples given of each category:



The following are caveats to this section of the document:

1) The DAC working group did not do a comprehensive review of all FAA communications, past and present, since this was out of scope. However, the below represents some of the most common gendered terms found in modern FAA communications, based on the group's experience.

2) As with many style guides, the appropriate terms sometimes differ based on context. For example, some terms may be appropriate for written communications but not for spoken ones, such as air traffic control, where syllables should be minimized and homophonic similarities with other aviation terms avoided. In other cases, different terms may be used for aviation professionals versus the general lay public. With this in mind, we have broken the below recommendations into three categories: formal writing, informal writing, and spoken.
3) Although we did look at what some other aviation and aerospace organizations have done to reduce gendered language, we did not do a comprehensive review of all relevant government and industry groups, both in the United States and elsewhere. Even among those that we did survey, there is often no consensus on preferred terms. As is often the case, technology and society both cause language to evolve, and this evolution is still in progress around the world. So replacing "man" in aviation language is complicated by the fact that semi-autonomous technology is simultaneously replacing *humans* from many aviation roles, even challenging the fundamental concept of a "pilot in command." We have attempted to future-proof our recommendations with this in mind, but we are aware that technology's advance will likely lead to further changes in the language of aviation over the years to come.
4) Regarding the use of "drone," we believe that this is a useful and increasingly widely used word that encompasses all of the various flight and control modes (from remotely piloted to fully autonomous) and aircraft types that currently fall under the category of "unmanned." We are, after all, representing the FAA's *Drone* Advisory Committee, which is certainly a nod toward acceptance of the word. As such, we have suggested it for long-term consideration as an official designation eventually replacing "uncrewed," which has some suboptimal characteristics we discuss below. Some of the members of the TG-10 suggested the use of the term *remotely piloted aircraft systems*, recognizing that all operations will have an assigned responsible operator. However, before "drone" can be accepted as official FAA terminology, it must be fully defined and that is out of scope for this working group.
5) This information is not meant to broadly define how aviation terms are used or the means with which operations are conducted. It only addresses the issue of suggesting gender-neutral language for future use. These recommendations must be harmonized with other aviation terminology initiatives.

Formal FAA Written Language Recommendations[16]

Current FAA term	Where typically found	Proposed alternative from currently used regulatory terms	Optimal term for long-term use	Example	Reason	Reason for not selecting other terms
Airman/Airmen	Government, Manufacturers & SW Developers, Press/Media, FAA handbooks and Manuals	Aircrew	Aviator(s)	Please show your aircrew certificate to the inspector.	More inclusive of all individuals	**Operator:** "Crew" is acceptable, but may imply more than one person so is not optimal long-term. "Operators" can be individuals or groups, including those who might not be FAA licenced or in command. Also acceptable but not optimal
Chairman/ Chairwoman	Meetings and minutes	Chair		Melissa serves as chair of the new task group.	Inclusive term for a leadership role; chairperson not used by AP*	
Cockpit	Manuals and placards found throughout airplanes.	Flightdeck		The flightdeck remains off limits to passengers.	On occasion masculine crew members have wielded the term "cockpit" to exclude or	

					undermine femme coworkers. * *Terms are used interchangeably in the regulations.	
He/She His/Hers (S)He His or Hers He or She		They, Them, Their, Theirs		Every passenger must store their belongings in the overhead compartment or under the seat in front of them.	When speaking about people-in-general, using the singular "they" avoids excluding certain individuals as well as cumbersome constructions that introduce complexity.	**"His or her":** This construction is unnecessarily wordy and enforces a gender binary.[17]
Manmade		Manufactured, built, fabricated, constructed, machine made		Detect-and-avoid technologies must be able to detect both naturally occurring and manufactured materials		
Manmade obstacles	Aeronautical charts	Structural obstacles		As in IFR and VFR sectional legends		
Manned aviation		Traditional aviation				
Notices to airmen (NOTAM)	Bulletins, ATIS, Dispatch releases	Some thoughts on an interim	Notice to all			

[17] Although "they" as a singular pronoun traditionally has been both widely used *and* considered ungrammatical, this is changing. Not only is it common parlance, but the introduction of "they" as a non-binary gender pronoun formalizes its grammatical acceptability.

		step of retaining the acronym but changing its underlying terminology: 1. *NOTAM* could be replaced with *notam* — a new noun in its own right (no longer an acronym) that means "notice to aviators." 2. The "A" could be redefined as the missing "All" leaving the "M" available for redefinition with a word such as "Mission Commanders" or "Missions." 3.Let the "AM" stand for American Airspace, as in "NOTice for AMerican airspace."	aviators (NOTAV)			
Pronouns		Always use an individual's		Examples include: She/Her/Hers		

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		preferred pronouns, even if they are unfamiliar to you.		Sie/Hir/Hirs They/Them/Theirs He/Him/His		
Repairman	"Repairman Certificate"	Technician				
Unmanned		Uncrewed	Drone (can be used a noun or adjective)		The U.S. General Accounting Office has suggested "uncrewed" as the preferred gender-free alternative to "unmanned."	**Remotely operated, Remotely piloted:**[18] Drones are increasingly highly automated and may have limited capacity for manual control (ie, piloting), relying instead on automated flight modes or pre-planned flight paths.
sUAS or Small unmanned aerial system	Manufacturers & SW Developers, Influencers, Government, Academia, Press/Media	Small uncrewed aerial system	Small Drone System		The U.S. General Accounting Office has suggested "uncrewed" as the preferred gender-free alternative to "unmanned." This retains the "U," which would allow acronyms to remain unchanged,	**Remote Operator in Command (ROC), Remotely-Operated Aerial System (ROAS), Remotely-Piloted Aerial System (RPAS)**: See Unmanned above

[18] The FAA now uses "operator" in its drone certification Means of Compliance (MoC) to refer to the ground crew in command.

					both within the FAA and elsewhere in aviation. However, since "uncrewed" may incorrectly imply to some that there are no humans involved at all, not even on the ground, this is not optimal. "Unoccupied" is slightly clearer but has the disadvantage of being wordier. Thus, we recommend that the word "drone" be considered for formal definition and use in the future.	
Unmanned aviation	Manufacturers & SW Developers, Influencers, Government, Academia, Press/Media	Uncrewed aviation[19]	Drone aviation		See "Unmanned" above	**RPAS, ROC, ROAS:** See Unmanned above
UAS or Unmanned aerial	Manufacturers & SW Developers,	Uncrewed aerial system	Drone system		See "Unmanned" above	**RPAS, ROC, ROAS:** See Unmanned

[19] One advantage of "uncrewed" replacing "unmanned," at least in the short term, is that it maintains the use of a "U" in acronyms, which minimizes renaming disruption in both FAA and other aviation groups. "Uncrewed" does not necessarily mean that no humans (such as a pilot in command) are involved — however, this is a nuance that may be lost on a lay audience.

system	Influencers, Government, Academia, Press/Media					above
UAV or Unmanned aerial vehicle	Manufacturers & SW Developers, Influencers, Government, Academia, Press/Media	Uncrewed aerial vehicle	Drone		See “Unmanned” above	**RPAS, ROC, ROAS:** See Unmanned above
Unmanned traffic management (UTM)		UAS Traffic Management				
NATO/ICAO Phonetic Alphabet	ATC and other radio communications	We considered, but propose no changes be made.		"Romeo, Juliett, Papa, Victor, Mike"	These are aural indicators without actual meaning, so the fact that some signifiers could have gendered connotations is less impactful. Most importantly, we are concerned about the negative safety impact of changing phonetic signifiers that are so crucial to the safety of controlled operations.	

Informal FAA Written Language

Current FAA Term	Where typically found	Proposed Term(s)	Notes
Airman/Airmen	Government, Manufacturers & SW Developers, Press/Media,	Aviator(s)	"Crew" is acceptable, but may imply more than one person so is not optimal long-term. "Operators" can be individuals or groups, including those who might not be FAA licenced or in command. Also acceptable but not optimal
Unmanned	Government, Manufacturers & SW Developers, Press/Media,	Drone (can be used a noun or adjective)	
sUAS or Small unmanned aerial system	Manufacturers & SW Developers, Influencers, Government, Academia, Press/Media	Small Drone System	
Unmanned aviation	Manufacturers & SW Developers, Influencers, Government, Academia, Press/Media	Drone aviation	
UAS or Unmanned aerial system	Manufacturers & SW Developers, Influencers, Government, Academia, Press/Media	Drone system	
UAV or Unmanned aerial vehicle	Manufacturers & SW Developers, Influencers, Government, Academia, Press/Media	Drone	

Air Traffic Control (Spoken) Language

Current FAA Term	**Proposed Term(s)**	**Example**	**Why**
Airman/Airmen	Pilot/Operator/ Aviator/Aircrew	Please show your **Pilot/Operator/Aviator/Aircrew** certificate to the FAA inspector.	More inclusive of all individuals
NOTAM	Retain for now, pending redefinition or change in the term (as per first tab)		
Manmade obstacles	Structural Obstacles	As in IFR and VFR sectional legends	More inclusive of all individuals
Repairman/Repairmen	Technician	To be eligible for a **technician** certificate each applicant is required by § 65.101 to...	More inclusive of all individuals
UAS	Retain for now, since only the acronym is typically used in spoken ATC language even as the underlying words may change as per first tab		
Cockpit	Flightdeck	The **flightdeck** remains off limits to passengers.	On occasion masculine crew members have wielded the term "cockpit" to exclude or undermine femme coworkers. The terms *flightdeck* and *cockpit* are used interchangeably in the regulations.

Phonetic alphabet	We considered, but propose that no changes be made.	"Romeo, Juliett, Papa, Victor, Mike"	These are aural indicators without actual meaning, so the fact that some signifiers are gendered is less impactful. Most importantly, we are concerned about the negative safety impact of changing phonetic signifiers that are so crucial to the safety of controlled operations.

IV. Purpose

A. Audience

The Tasking team identified more than 130 individual audiences within aviation in categories of government, standards development organizations, labor groups, manufacturers-software developers, academia, influencers, press-media and the general public.

B. Why Gender-Neutral Language?

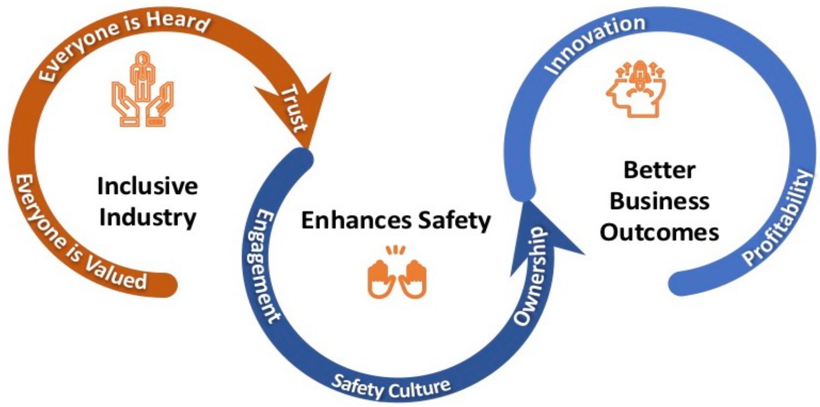
As it grows and matures, the drone industry has an opportunity to use and embrace gender-neutral language that defines it as an industry that is respectful, welcoming, and brings value to the receiver.

Today, women and other marginalized groups are significantly underrepresented in the aviation industry. This state of affairs contributes to the shortage of pilots and other aviation professionals. Aviation industry bodies accordingly have developed and adopted programs that help increase the number of women and other underrepresented groups. Avoiding imprecise and exclusionary language can help create a work environment where all workers feel safe sharing their views, thereby improving psychological and operational safety. Diversity and inclusion also lead to better business outcomes. Research shows that the utilization of gender-neutral language can lead to a more inclusive environment that draws more people to the industry and helps keep them there. Accordingly, entities ranging from international bodies to airlines have adopted gender-neutral language.

For all these reasons, we recommend that the Federal Aviation Administration move to adopt gender-neutral language in the drone industry. To ensure inclusion of all regardless of gender identity, and to avoid burdensome constructions, we recommend using gender-neutral language (e.g., “person”) rather than gender-binary language (e.g., “man or woman”).

INCLUSIVE LEADERSHIP

Sustainable talent of the best and the brightest by deepening the pool



Graphic created by Patricia Gilbert for this report.

C. Language Matters: Diversity and Inclusion in the Drone Industry Can Enhance Attraction and Retention of Professionals, Psychological Safety, and Business Outcomes

The aviation industry, like many other science, technology, engineering, and mathematics (STEM) industries, has had a long history of homogenous gender and racial participation in the United States.[20] Today, that engagement has not significantly changed, resulting in a continued gap of women and other underrepresented groups in aviation participation. Addressing this imbalance can help this nascent industry develop into one that attracts and retains the best and brightest professionals, creates a safe environment in which those professionals can grow and thrive, and realizes all the business advantages of inclusivity.

1. Gender-Neutral Language Helps to Create an Inclusive Culture for Attracting and Retaining Professionals

The aviation industry generally, and the drone industry specifically, lacks gender diversity.

We are aware of anecdotal stories of some in the industry expressing disbelief regarding the existence of gender disparities. When an individual is a member of the single majority group of an industry, subconscious filters occur that blind the individual of the realities of the lack of

[20] Ibid.

inclusion and diversity of the entire industry.[21] An examination of the data quickly proves the existence of gender disparities in aviation.

By the end of 2019, there were more than 664,000 pilots and more than 714,000 non-pilot aviation jobs in the United States. Of those, only 52,700 pilots and 215,900 non-pilots are women. That means 7.9 percent of the pilots in the U.S. are women and 30.2 percent of non-pilot related workers are women. Furthermore, when flight attendants are subtracted from the non-pilot jobs, the number of women in non-pilot jobs in 2019 is 21,300, or 4.6 percent of the total jobs. The growth rate of these categories has been slow. From 2010 to 2019 the compounded annual growth rate of women as pilots was 1.9 percent; the number of women in total non-pilot jobs has grown 3.7 percent annually over the same period. In other words, while the number of jobs has grown, the number of women has remained far below the population ratio of women to men.[22]

Furthermore, the gender disparity is greater among those in the highest ranks of commercial pilots. Although women make up 6 percent of commercial pilots, they are only 3.57 percent of captains, as shown by this data from the Air Line Pilots Association (ALPA):

Gender	Captain	%	First Officer	Second Officer	Grand Total	% of Total Population
Female	934.00	3.57	2,503.00	3.00	3,440.00	6.00
Male	25,503.00	97.57	30,486.00	6.00	55,695.00	94.00
Grand Total	26,137.00	100.00	32,989.00	9.00	59,135.00	100.00

Unfortunately, the known numbers of drone pilots are not any better. For remote pilots, records started with the creation of Part 107 in 2016. In 2019 there were 160,000 remote pilots; of those, 10,800 or 6.7 percent were women. Although the number of women as remote pilots has increased 10.5 percent per year from 2016 through 2019, the number still remains low.[23]

[21] Jolls, C. and Sunstein, C.R. “The Law of Implicit Bias.” 94 Calif. L. Rev. 969, 2006. https://digitalcommons.law.yale.edu/cgi/viewcontent.cgi?article=2823&context=fss_papers. Last accessed 15 May 2021.

[22] “U.S. Civil Airmen Statistics,” FAA annual statistics, published in 2020 (shows 2010 through 2019 data). https://www.faa.gov/data_research/aviation_data_statistics/civil_airmen_statistics/

[23] ibid.

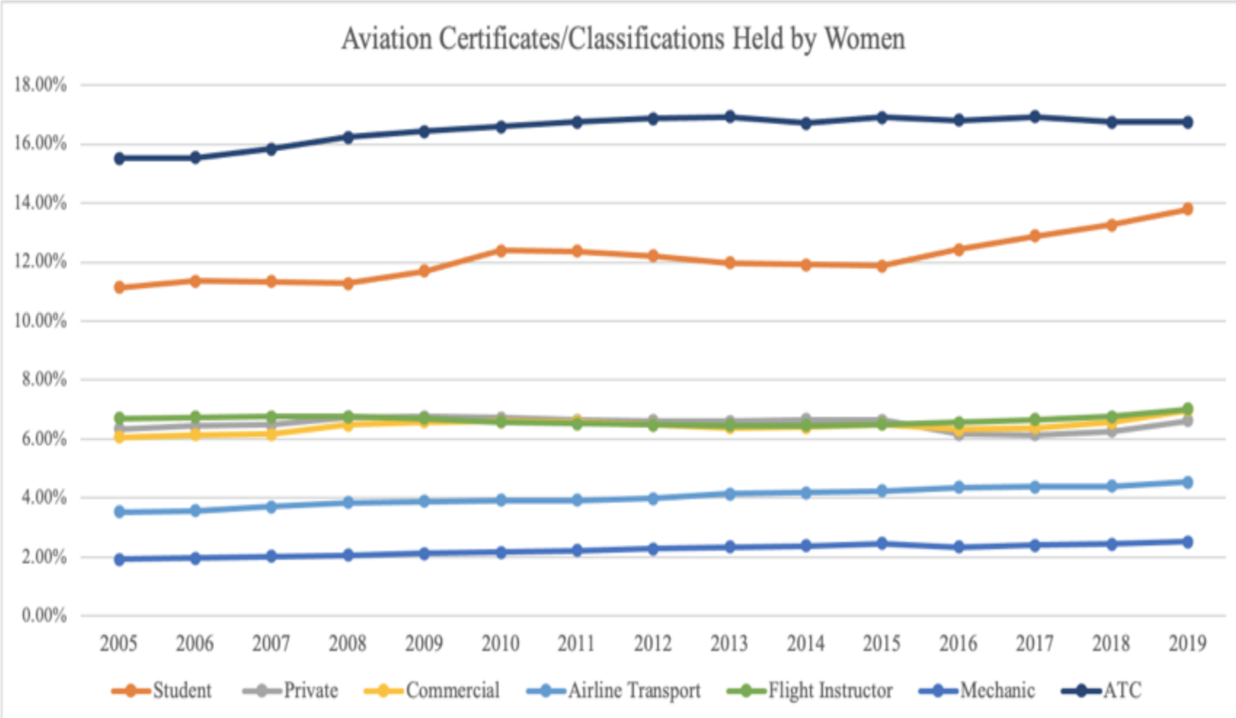


Table created from FAA/DOT data compiled by Dr. Rebecca K. Lutte[24]

There is, however, hope for the future, with women making up 13.8 percent of student pilots.[25] The percentage of women in engineering, although not high, is growing as well, providing additional opportunities for women to enter the aviation sector.[26]

It is important that we seize the opportunity to welcome and encourage those considering entering the drone industry. Although we do not have data regarding gender identity in the aviation industry generally or the drone industry specifically, we also are mindful of creating a culture where individuals feel welcome, valued, and respected regardless of race, gender, religion, national origin, sexual orientation, or other diversity traits.

Inclusion Helps Attract and Retain Professionals in the Industry

The low number of women in the aviation industry generally, and the drone industry in particular, means that there is an untapped reservoir of talented individuals who can contribute to this industry.

[24] Lutte, Rebecca K. "Women in Aviation: A Workforce Report." University of Nebraska at Omaha Aviation Institute, May 2019. Last accessed 15 May 2021.

[25] https://www.faa.gov/data_research/aviation_data_statistics/civil_airmen_statistics/

[26] https://www.nsf.gov/statistics/2017/nsf17310/digest/fod-women/engineering.cfm

	Aviation Occupation	% Women
< 10%	Maintenance technicians Airline executives (CEO, COO) Airline transport pilots Total pilots	2.5% 3.0% 4.6% 7.9%
10% - 20%	Aerospace engineers Airport managers Air traffic controllers Dispatchers	11.6% 16.7% 16.8% 19.4%
20% >	Flight Attendants Travel Agents	79.2% 79.5%

Table created compiled by Dr. Rebecca K. Lutte[27]

When an organization or industry does not reflect the makeup of the general population in regards to gender and other underrepresented characteristics, the ability to attract and retain talent becomes very difficult.[28] For example, if an individual who comes from an underrepresented gender, ethnic, or racial group is exposed to language or activity during training or at their place of employment that is non-inclusive, the individual may be more likely to leave that employer and industry due to those negative experiences.

Attracting and retaining people regardless of gender or gender identity is crucial for finding the best and the brightest so that the drone industry does not face the same labor shortages currently affecting the broader aviation industry. Boeing estimates that North America alone will need 208,000 new pilots, 192,000 new technicians, and 169,000 new cabin crew members between 2020 and 2039.[29] Yet the Aircraft Owners and Pilots Association (AOPA) notes that "the number of pilot certificates issued by the Federal Aviation Administration has decreased more than 60 percent since 1980."[30]

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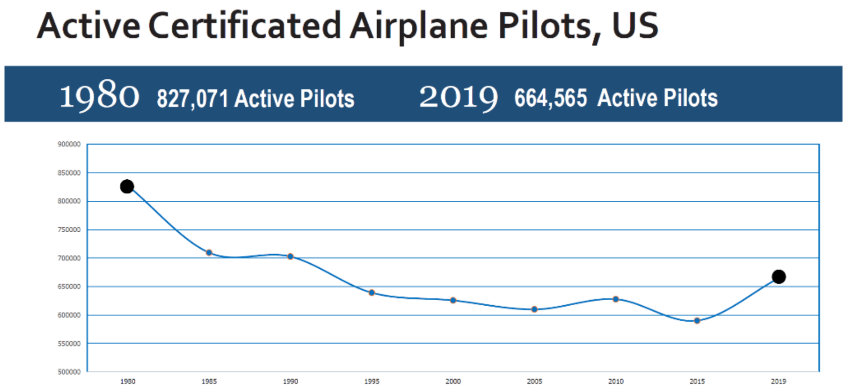
27 Ibid

28 Bettinger, E.P. and Long, B.T. "Do Faculty Serve as Role Models? The Impact of Instructor Gender on Female Students." *The American Economic Review.* Vol. 95, No. 2, Papers and Proceedings of the One Hundred Seventeenth Annual Meeting of the American Economic Association, Philadelphia, PA, January 7-9, 2005. American Economic Association, 2005, pp. 152-157.

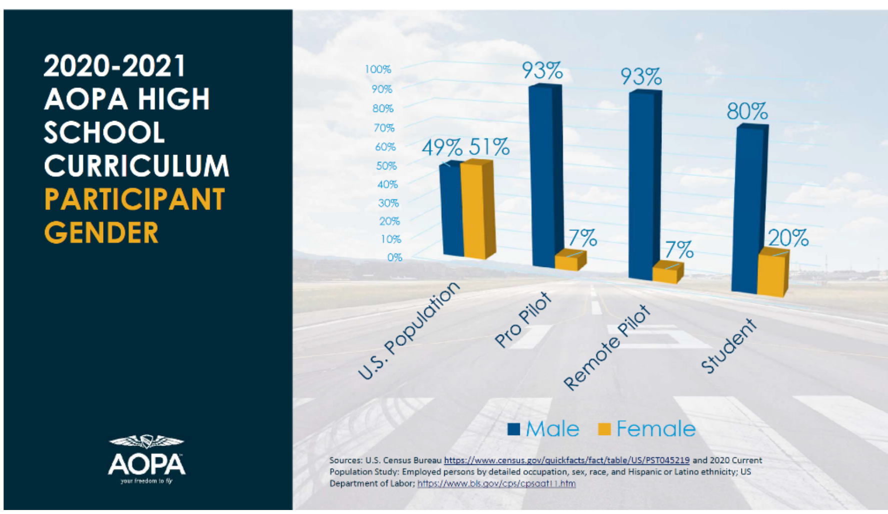
29 Boeing, Pilot and Technician Outlook 2020-2039, https://www.boeing.com/commercial/market/pilot-technician-outlook/

30 AOPA High School Stem Curriculum, Aircraft Owners and Pilots Association, 2021 https://youcanfly.aopa.org/high-school/high-school-curriculum

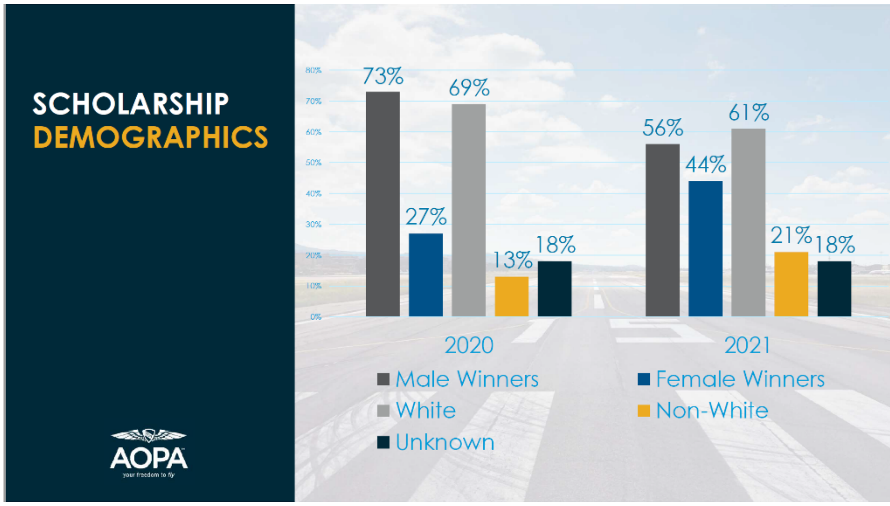


[Source: AOPA]

To expand the pilot population and the aviation community, industry groups and trade associations have developed education and outreach programs that include reaching out to groups that have been underrepresented in aviation. For example, AOPA's You Can Fly program, which includes a 4-year high school curriculum, has had success in enrolling female students at a rate (20 percent) that far outpaces the professional pilot (7 percent) and remote pilot (7 percent) rates – even if still falling well below their share of the population.



AOPA's High School Flight Training Scholarship Program offers upwards of $1 million a year for high school students and teachers. Each scholarship recipient receives $10,000 to pursue a primary pilot certificate. In 2021, AOPA reached out to organizations serving underrepresented groups to get the word out on the scholarships; as a result, female recipients jumped from 27 percent to 44 percent, and non-white recipients jumped from 13 percent to 21 percent — in just one year.



These results belie any assertion that low numbers of women and other underrepresented groups in aviation is attributable to lack of interest rather than other factors. In other words, it is not enough to say, "All they have to do is come join us."

In addition to meeting labor needs, a larger number of people pursuing careers will help to amplify the industry's voice, thereby increasing its influence in the legislative and regulatory spaces, for example. As of April 14, 2021, the 117th Congress includes 146 women Members, amounting to 26.9 percent of the total membership. With an increasingly diverse (although still gender unequal) Congress, having an industry that is more reflective of the electorate can only increase its resonance with elected officials.[31]

Gender-neutral language is one of the ways to create an inclusive and diverse organization and culture. Gender-neutral language does not isolate or identify one specific gender as an assumed identity of the organization or industry; instead it assumes an inclusive culture and diverse workplace as the default. Academia, the business community, and society have demonstrated the importance and need for adopting gender-neutral language as one method among many to foster inclusion, diversity, and safety.

The Institute for Women Of Aviation Worldwide (iWOAW) instituted a petition on Change.org calling on the Federal Aviation Administration and the International Civil Aviation Organization to "Eliminate Gender-Exclusive Words that Keep Women out of Aviation." The petition reads, in relevant part: "Women do feel ostracized and are steering away from the aerospace careers publicly labelled as men's careers."[32] This sentiment is consistent with research showing how gendered language can lead to stereotyping and other negative outcomes. This contributes to unintended references that aviation careers belong to men. Earlier this year, this was

[31] Congressional Research Service, "Membership of the 117th Congress: A Profile," April 14, 2021, available at https://crsreports.congress.gov/product/pdf/R/R46705.

[32] Petition to Help Eliminate Gender-Exclusive Words that Keep Women out of Aviation, Change.org, 2020, https://www.change.org/p/tell-the-faa-and-icao-to-eliminate-gender-exclusive-words-that-keep-women-out-of-aviation-from-their-publications

demonstrated during a CNBC interview[33] on pilot shortages when the guest expert used "he" and "those guys" to refer to pilots in general.

In Bigler and Leaper's metastudy referenced earlier, the researchers analyzed the impact of gendered language on children. This study is highly relevant to our current endeavor, given the desire to draw more people of all genders into the drone space. The authors found, "The use of gendered nouns appears to precipitate a cascading sequence of (1) gender salience, (2) gender categorization, (3) gender stereotyping and (4) gender prejudice."[34] As the authors pointed out, labels that many consider innocuous create this sequence in children, which is then reinforced throughout their lives. The authors noted the utilization of gendered nouns such as "mankind" and "freshman" and pronouns like "he" and "his" to refer to people-as-such in English.[35] This is relevant to our examination of "unmanned" and other terminology that is used in similar ways. Despite the *intention* for such terms to be universal, "empirical studies have demonstrated that children and adults who read material using masculine generic pronouns were overwhelmingly more likely to imagine male than female characters."[36] Studies also showed that gendered language affected children's and adults' interests,[37] as well as how they viewed other people's occupational prospects in light of their gender.[38]

Given the evidence of the impacts of gendered language — which are at best limiting and at worst actively harmful — the next question is whether moving away from such language has a positive impact on attitudes.

To improve gender equality and tolerance toward minorities, several nations have promoted the use of gender-neutral pronouns and words. Margit Tavits and Efren O. Perez studied whether these linguistic devices actually reduced biases that favor men over women. The study was executed with three large-scale experiments in Sweden, which formally incorporated in 2015 a gender-neutral pronoun into its language alongside established gendered pronouns equivalent to *he* and *she*. Swedish adults were invited to participate in online surveys that were described as focusing on the effects of visual perception, reading comprehension, and creative thinking on political judgment. This study showed that the reduced use of male pronouns relative to non-male pronouns affected mass opinion toward gender equality in politics. Speakers who used masculine pronouns were more likely to endorse traditional gender roles, as they aligned with a male-centered view. In contrast, gender-neutral pronouns effectively diminished this pro-male bias. The evidence showed that compared with masculine pronouns, use of gender-neutral pronouns decreased the mental reference to males. This shift was associated with individuals expressing less bias in favor of traditional gender roles and

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[33] Fortt, Jon. "Aviation industry to face post-pandemic pilot shortage, study shows." CNBC.com, 22 Mar 2021. https://www.cnbc.com/video/2021/03/22/aviation-industry-to-face-post-pandemic-pilot-shortage-study-shows.html. Web video last accessed 14 May 2021.

[34] Bigler and Leaper, 191.

[35] *Id.* at 189.

[36] *Id.* at 190.

[37] *Id.*

[38] *Id.* at 192.

categories, as reflected in more favorable attitudes toward women and LGBT individuals in public life. Additional analyses revealed similar patterns for feminine pronouns. The influence of both pronouns was more automatic than controlled. By prying apart language from culture, these studies helped to establish further that language effects on cognition are real and uniquely tied to structural features of communication.[39]

Gender-neutral language is particularly important in the regulatory and legislative context. Kadija Kabba, a Legal Officer and Legislative Drafter at the Central Bank of Sierra Leone, has shown how gender-neutral language is a tool that serves precision, clarity, and unambiguity in that it aims to promote gender specificity in the pronoun used when drafting legislation. It reduces and in some cases completely omits redundancies and, in the process, produces shorter sentences that in turn produce clear and unambiguous drafts.[40] Australia, Canada, New Zealand, and the United Kingdom have long embraced gender-neutral language in legislative drafting.[41] "It has been established that the use of gender-neutral language serves not only to eliminate the demeaning nature of gender-specificity in drafting legislation but also to achieve precision, clarity and unambiguity, using the best techniques of the language for the job on each occasion."[42]

2. An Inclusive Workplace that Uses Inclusive Language Is a Safer Workplace

As with all DAC taskings, this group views safety as paramount. We acknowledge that some may raise concerns that a change in nomenclature, for which we advocate, could lead to confusion and, therefore, diminish safety. That said, we believe that the measured, phased transition to new language outlined in this report will make for a safe transition to new language. Moreover, our research demonstrates that, far from undermining safety, an inclusive workplace that uses language inclusive of all workers is in fact a workplace with an enhanced safety profile. We are by no means intimating that the current system is unsafe; rather, we believe there is an opportunity to bring safety to an even higher level by elevating inclusion.

Furthermore, the use of inclusive language that accurately reflects the makeup of the workforce makes for a safer work environment. People naturally feel safer when they are included as a member of the crew, rather than feeling that they are an outsider if they are not part of the dominant group. And the current use of language that, in addition to being exclusive, is imprecise (e.g., using the word "unmanned" to refer to a vehicle with no woman aboard) misses out on an opportunity to achieve higher safety results.

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[39] Tavits, M. and Perez, E.O. "Language influences mass opinion toward gender and LGBT equality," Proceedings of the National Academy of Sciences of the United States of America, August 5, 2019, available at https://www.pnas.org/content/116/34/16781.

[40] Kabba, K. "Gender-neutral language: an essential language tool to serve precision, clarity and unambiguity," Commonwealth Law Bulletin, 2011, 37:3, 427-434, DOI: 10.1080/03050718.2011.595141, available at https://www.tandfonline.com/doi/full/10.1080/03050718.2011.595141.

[41] *Id.* at 429-30.

[42] *Id.* at 433.

The proper use of terminology is critical to ensure that safe operations can be achieved consistently. One example of how proper terminology is critical to the safe operation of aircraft is Crew Resource Management (CRM). The Crew Resource Management communication model is now a common training aspect in commercial and corporate flight departments, and is a key operational component for personnel deemed essential to flight safety. Historical aviation training focused on the technical aspects of pilot training around the operation of an aircraft. However, as the focus of accident investigations shifted to include systemic, organizational, and cultural deficiencies, accident and incident reports began to address human factors-related errors. Accident reports have noted that "poor group decision making, ineffective communication, inadequate leadership, and poor task or resource management"[43] skills were contributing factors to accidents or incidents. Past training did not focus on the interactions among crewmembers that are fundamental to safe operations but rather concentrated on observing and evaluating an individual's performance as a lone participant in the operation of the flight.

It was assumed that the individual pilot, or captain, could handle the operation of the aircraft and that others were there to provide assistance when asked. This hierarchy of duties was a stereotype of early aviation when single-pilot operations were flown. As airline aircraft became more complex, the assumption that a single pilot could handle the operation and any safety issues solely was recognized as a hazard in aviation. The "team" concept needed to be trained and implemented in flight operations to reduce the possibility of an accident because of a failure of communication or workload between crewmembers. Crew Resource Management also incorporates an introspective review component to help individuals avoid hazardous attitudes and mindsets that could lead to or contribute to an accident.

The concept of Crew Resource Management has progressed over the years and moved beyond the flight deck to recognizing that there are multiple team interactions that can negatively affect safe operations if not addressed. Today, Crew Resource Management training continues to focus on situational awareness, communication skills, teamwork task allocation, and decision making within a comprehensive framework as part of the safety and risk management strategies.

Many aspects go into the current field of human factors, that is, optimizing human performance and reducing human error by incorporating principles of the behavioral and social sciences, engineering and psychology. For purposes of this paper, and for simplification of the topic, we are going to focus on the Crew Resource Management communication aspect. That is, team communication can be negatively affected by words, either spoken or written.

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[43] "AC 120-51E - Crew Resource Management Training," CRM training, FAA, 8 Feb 2001, page 4. https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/22879. Last accessed 17 May 2021.

Biases and attitudes have roots in culture. Culture can be influenced by nationality, religion, where people live, etc., and can be split into National, Organizational, and Professional.[44] Culture exists everywhere in the world, including locally at individual airlines or other companies. Culture is built at an airline through the priorities and ethics that are passed down from upper management to employees and is something that is built on historical actions over a long period of time.

One example of how both national culture and organizational culture can affect human factors and aviation safety is through the analysis of the crash of Asiana Airlines flight 214, a Boeing 777-200ER that struck a seawall short of the runway at San Francisco International Airport (SFO) on July 6, 2013. The accident resulted in three passenger fatalities and 40 serious injuries of the 291 passengers, and nine serious crew injuries. The accident report notes that the "flightcrew mismanaged the airplane's descent." Generally speaking, they were flying the aircraft too low and too slow, which resulted in the accident. There were multiple instances where the pilot monitoring and the pilot observer (relief pilot) had opportunities during the final minutes before the accident to challenge the pilot flying, but neither did. The NTSB accident report noted that the pilot flying was being observed by the pilot monitoring following their training as part of their operating experience. The report notes the pilot flying was concerned about being embarrassed if he was unable to get the flight under control.[45] The report also reflects that the pilot monitoring did not use clear and direct language to correct the pilot flying, even when he saw deviations from standard operating procedures. The NTSB report notes that the airline recommends using as much automation as possible during the flight,[46] so when the pilots inadvertently deactivated one of the automatic systems, the crew was unable to understand and respond to the loss of the technology fully.

Interactions between crew where there may have been an implied, or actual, hierarchy of power in many situations created a communication gap, as noted in accident reports — for example, the idea that the captain has sole authority and should not be questioned or challenged.

As noted earlier in this paper, some gendered language can contribute to a breakdown in team communication by reinforcing the old stereotypical hierarchical view of roles. While this barrier to communication may not be as blatant as the previous example, the subtle nuances of an implied hierarchy of power can be just as detrimental to the team aspect of safety.

3. Workplace Diversity Leads to Better Business Outcomes

Bringing more diversity to the workplace yields cultural and competitive advantages. Diversity of thought is the overriding competitive advantage, allowing for varied perspectives and skill sets that deliver faster, more innovative solutions. From a cultural perspective, diversity

[44] "Organizational Culture," SKYbrary, 2 Oct 2020, https://www.skybrary.aero/index.php/Organisational_Culture. Last access 17 May 2021.

[45] NTSB Accident Report, NTSB/AAR-14/01, adopted June 24, 2014, page 11.

[46] NTSB report, page 62.

supports a better understanding of broader consumer and co-worker needs. The bottom line is that diversity in the workplace leads to a more engaged, satisfied workforce, attracting more new talent, which will deliver more competitive and profitable products.[47] Diversity benefits can include, among other things, solving problems more quickly,[48] higher profits,[49] and increased employee engagement.[50]

V. Conclusion

Task Group #10 thanks the FAA for this tasking which allows "the DAC the opportunity to lead promoting and instituting gender-neutral language throughout the UAS/drone community". We look forward to continuing to work closely in assisting the FAA, the drone community and the aviation industry as a whole in supporting and adopting these recommendations.

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47 Zojceska, A. "Top 10 Benefits of Diversity in the Workplace," Talentlyft, December 19, 2018, available at https://www.talentlyft.com/en/blog/article/244/top-10-benefits-of-diversity-in-the-workplace.

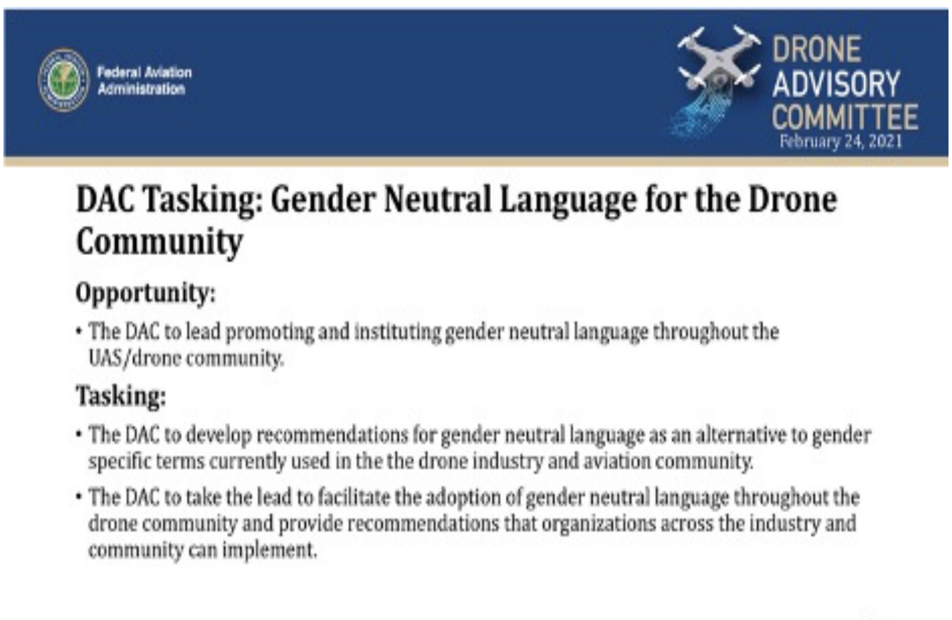
48 *Id.*, citing Harvard Business Review article March 31, 2017 – 'Teams Solve Problems Faster When They're More Cognitively Diverse.'

49 *Id.*, citing McKinsey & Co. Research April, 2012 – 'Is There a Payoff for Top Team Diversity.'

50 *Id.*, citing Deloitte Research May, 2013 – 'A New Recipe to Improve Business Performance.'

VI. Appendix

Tasking



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Mills	Houston	United Parcel Service
Reed	Mark	Airline Pilots Association
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Scott	Mariah	Skyward
Smith	Phil	Shell
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Federal Aviation Administration

DRONE ADVISORY COMMITTEE

June 23, 2021

Housekeeping

- Meeting is being livestreamed on the FAA's YouTube, Twitter and Facebook pages.
- Meeting is also being recorded and will be made available for future viewing.
- Please remain muted during the presentations.
- After each briefing, there will be an opportunity for the members to engage in discussion and ask questions.
- Please raise your hand using the Zoom command on your dashboard and an FAA moderator will call on you to speak.
- FAA team is monitoring the livestream, if you have any problems during the meeting, please reach out in the comments.

Federal Aviation Administration

DRONE ADVISORY COMMITTEE

June 23, 2021

Official Statement of the DFO

PUBLIC MEETING ANNOUNCEMENT

Read by: Designated Federal Officer Jay Merkle

Drone Advisory Committee

June 23, 2021

In accordance with the Federal Advisory Committee Act, this Advisory Committee meeting is OPEN TO THE PUBLIC. Notice of the meeting was published in the Federal Register on:

May 13, 2021

Members of the public may address the committee with PRIOR APPROVAL of the Chair. This should be arranged in advance.

Only appointed members of the Advisory Committee may vote on any matter brought to a vote by the Chair.

The public may present written material to the Advisory Committee at any time.

Federal Aviation Administration

DRONE
ADVISORY
COMMITTEE

June 23, 2021

Agenda Review

Jay Merkle

Designated Federal Officer

FAA Drone Advisory Committee

Federal Aviation Administration

DRONE ADVISORY COMMITTEE

June 23, 2021

Agenda

	Start	Stop	
1.	12:00 pm	12:05 pm	FAA – Greetings & Logistics
2.	12:05 pm	12:10 pm	DFO – Read Official Statement of the Designated Federal Officer
3.	12:10 pm	12:15 pm	DFO – Review of Agenda and Approval of Previous Meeting Minutes
4.	12:15 pm	12:20 pm	DFO – Opening Remarks
5.	12:20 pm	12:25 pm	Chair – Opening Remarks
6.	12:25 pm	12:55 pm	Chair – Task Group 9 Recommendations – Report on Situational Awareness
7.	12:55 pm	1:25 pm	DFO – Unmanned Aircraft Safety Team (UAST) Presentation
8.	1:25 pm	1:35 pm	BREAK
9.	1:35 pm	2:05 pm	Chair – Operations and Technology Subcommittee, Task Group 10 - Gender Neutral Language for the Drone Community Recommendations
10.	2:05 pm	2:15 pm	DFO – New Taskings to DAC
11.	2:15 pm	2:25 pm	Chair – New Business/Future Agenda Topics
12.	2:25 pm	2:28 pm	DFO – Closing Remarks/Final Thoughts
13.	2:28 pm	2:30 pm	Chair – Closing Remarks/Final Thoughts
14.	2:30 pm	2:30 pm	Chair – Adjourn

Federal Aviation Administration

DRONE ADVISORY COMMITTEE

June 23, 2021

Official Remarks from the DFO

Jay Merkle

Designated Federal Officer

FAA Drone Advisory Committee

Federal Aviation Administration

DRONE ADVISORY COMMITTEE

June 23, 2021

Official Remarks from the DAC Chair

Houston Mills

Chair

FAA Drone Advisory Committee

Federal Aviation Administration

DRONE ADVISORY COMMITTEE

June 23, 2021

Task Group 9 – Situational Awareness Recommendations

Lead: James Burgess

Presenter: Matthew Satterley

DAC Tasking

Opportunity: Can Remote ID be used to increase situational awareness between manned aviation that routinely operates at low altitudes away from airports and UAS operating in the same airspace?

Tasking: DAC to engage operators in low altitude airspace to obtain feedback on how remote identification might be used to increase situational awareness and use this feedback to develop recommendations on how the FAA can address responses to the RFI.

Dissecting the Problem Statement

- Follow the direction set by the FAA.
  - Voluntary participation in Remote ID for low-altitude manned operators.

- Explore the Spirit of the problem.
  - Explore existing technologies that can provide situational awareness to low-altitude aviators (traditional aircraft, GA, gliders, unmanned).

- What else do we know or need to investigate?
  - Identify areas outside of the scope of Task Group 9 that are important to consider with respect to situational awareness in low-altitude airspace.

Dissecting the Problem Statement

- Sub-Group 1 (AMA, AOPA)
  - Review *available* RFI responses; develop survey to send to low-altitude community; interview subject matter experts in industry, government, academia.
- Sub-Group 2 (BNSF, UPS)
  - Explore the applicability of existing/developing technologies to manned and unmanned aircraft including range, human factors, and cost.
- Sub-Group 3 (Dallas PD, Skyward)
  - Expectations for manned aircraft information and behavior are well-known in most airspace environments and increases in capability as regulations/standards are developed for unmanned aircraft.

Task Group 9 High-Level Recommendations

- The FAA should avoid technology-specific recommendations related to the use of remote identification, but instead emphasize the accessibility of publicly available remote identification information.
- Any updates to piloted aircraft practices and procedures should be voluntary and, when possible, should conform with existing electronic flight bag or onboard display technologies. Additionally, human-factors considerations should be investigated before promoting remote identification information to onboard piloted aircraft equipment.
- The UAS industry (partnering with the FAA and piloted aircraft community) should develop integration strategies that foster maximum cooperation in low altitude airspace, and create avenues for piloted aircraft to access information regarding UAS operations.
- The FAA should review existing policies related to piloted aircraft technologies to assess their adaptability to UAS use cases. For instance, emphasis and encouragement should be placed where UAS and piloted aircraft integration efforts are already underway. Where possible, the FAA and industry should rely upon already-existing technology (such as ADS-B).

DAC Tasking Group 9: Improving Low Altitude Situational Awareness For Manned and Unmanned Aircraft Subgroup 1

Presenters: Chris Cooper (AOPA) and Chad Budreau (AMA)

Note: The Tasking Group 9 is aware and members are participating in Tasking Group 10 regarding Gender Neutral Language recommendations for the FAA and aviation community. We will use the term UAS Operator and Piloted Aircraft in this set of recommendations. By "UAS Operator" we include the individual who is controlling the flight of the UAS, frequently called the Remote Pilot in Command. By "Piloted Aircraft," we include all types of aircraft (e.g., airplanes, lighter than air, rotorcraft, gliders, etc.) that have direct human intervention from within or on the aircraft.

Recommendation Summary

Determine and resolve safety and human factor issues	***Voluntary adoption utilizing current technological infrastructure***	***Determine and address appropriate standards (if necessary), filtering methods, and techniques***	***RID outreach campaign for low altitude aviator community***

Methodology

- Voluntarily obtained and reviewed 21 of the RFI responses
  - reoccurring themes
- Identified missing stakeholders and tools to best collect and analyze data from those stakeholders
- Two surveys developed
  - Piloted aircraft
  - UAS operators/manufacturers/service suppliers

Findings

- 332 total
- Piloted Aircraft Survey
  - 313 complete responses collected from representatives of 31 organizations
  - 49% of respondents said they typically operate below 1,000ft AGL
  - 74% think Remote ID information will be useful (46.5% think it will be very useful)
  - 67% think the ability to filter extraneous UAS Remote ID information and targets through an EFB will be important to their decision to voluntarily use UAS Remote ID information on the flight deck for situational awareness. 25% it may be an important factor.
  - 71% think Remote ID in their display will increase safety
  - 84% of respondents use an EFB and would like the Remote ID information to show on their EFB display
  - More than half (54%) Half of respondents think Remote ID data in their display will add to in-flight workload, 8% think it will reduce their workload
  - 18% responded to the RFI, 32% think their organization may have responded. Two respondents have changed their position about Remote ID since they responded to the RFI
- UAS Operators/Manufacturers/Service Suppliers
  - Most responses addressed the role that UAS Traffic Management, both broadcast and network, can play in making remote identification information available to operators in low altitude airspace

Recommendation 1: The FAA work collaboratively with academia, industry, and other relevant stakeholders to determine and resolve safety and human factors issues prior to making RID information available for piloted aircraft.

- Increased Workload and Distractions of Remote Identification

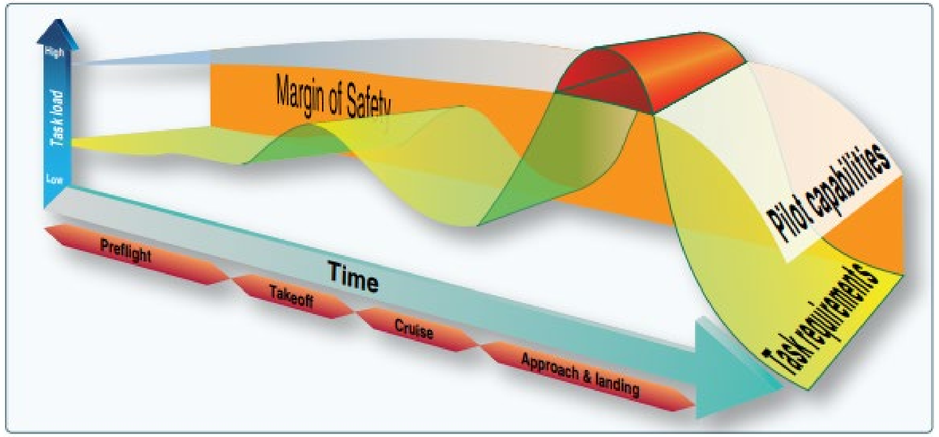


Figure 2-20. *The pilot has a certain capacity of doing work and handling tasks. However, there is a point where the tasking exceeds the pilot's capability. When this happens, tasks are either not performed properly or some are not performed at all.*

Pilot Handbook of Aeronautical Knowledge

Recommendation 2: Remote ID information should be made available and adopted only on a voluntary basis utilizing current piloted aircraft technologies.

- Usefulness and Safety of the Accessibility to Remote Identification
- Access to Remote Identification

Figure 1-7. *Example of an electronic flight bag.*

Figure 5-18. Portable flight bag.

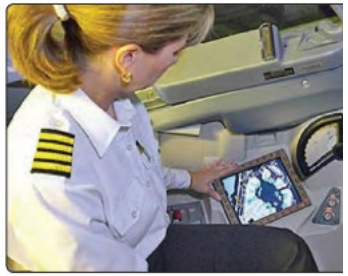


Figure 5-19. Installed flight bag.

Figure 2-21. *Electronic flight instrumentation comes in many systems and provides a myriad of information to the pilot.*

Pilot Handbook of Aeronautical Knowledge, Instrument Flying Handbook, Instrument Procedures Handbook

Recommendation 3: The FAA work collaboratively with academia, industry, and other relevant stakeholders to determine and address appropriate standards (as necessary), filtering methods, and techniques prior to making RID information available for piloted aircraft.

- Increased Workload and Distractions of Remote Identification

Recommendation 4: The FAA develop an outreach campaign to educate the low altitude aviator community about what RID is, how it can be used for situational awareness, and its limitations.

FAAST
FAA SAFETY TEAM

GAJSC

UAST
UNMANNED AIRCRAFT SAFETY TEAM

USHST
United States
Helicopter Safety Team

Thank you for all the work!

- A great team with a broad and deep aviation background agreed on these recommendations.

- Academy of Model Aeronautics
- Aero NowGen
- Air Line Pilots Association
- Aircraft Owners & Pilots Association
- ASTM
- BNSF Railway
- Dallas Police Department
- DJI
- FPV Freedom Coalition
- Experimental Aviation Association
- Global Air Drone Academy
- Helicopter Association International
- Joby Aviation
- National Agricultural Aviation Association
- OneSky
- uAvionix
- ULASS Global
- Wing

DAC Tasking Group 9: Improving Low Altitude Situational Awareness For Manned and Unmanned Aircraft Subgroup 2

Presenter: Jenn Player (Skydio)

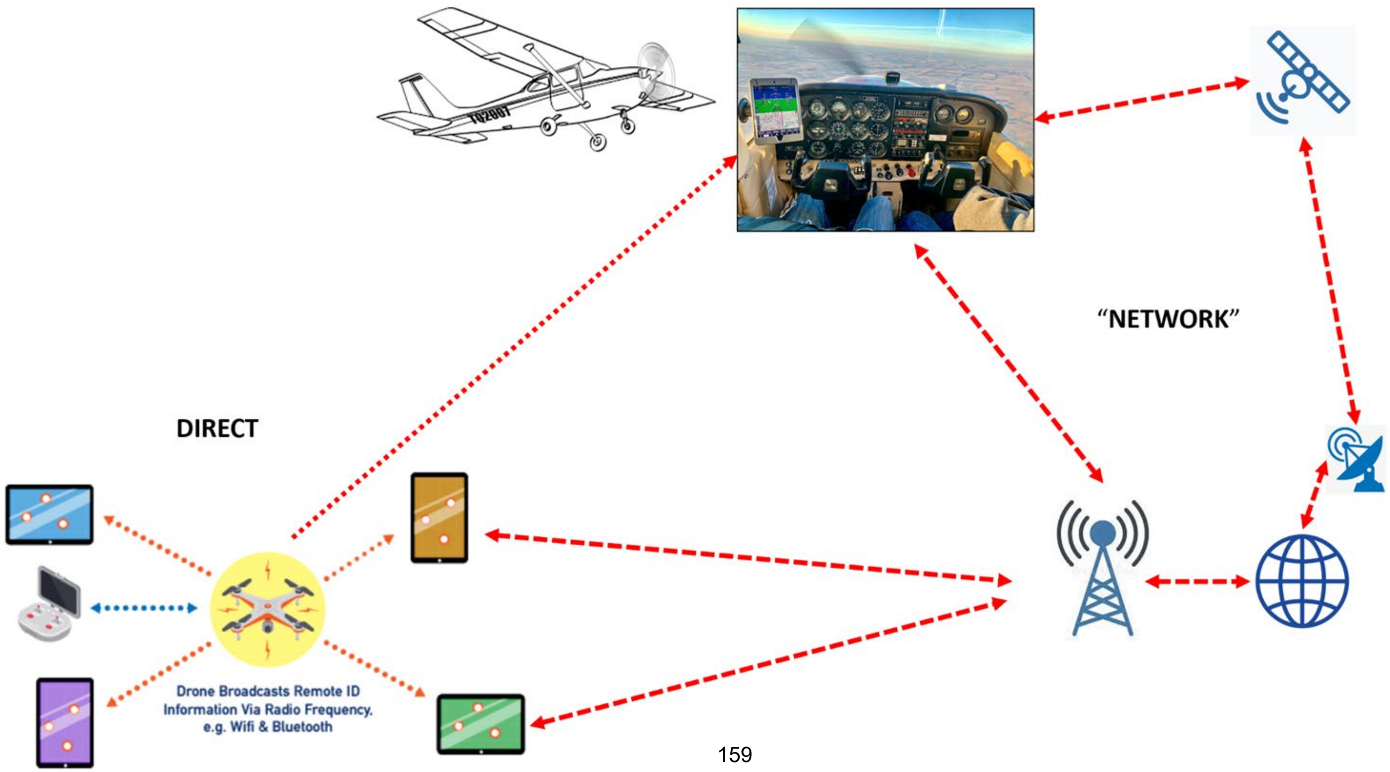
Note: The Tasking Group 9 is aware and members are participating in Tasking Group 10 regarding Gender Neutral Language recommendations for the FAA and aviation community. We will use the term UAS Operator in this set of recommendations and will use agreed-to terms in the future. By "UAS Operator" we include the individual who is controlling the flight of the UAS, frequently called the Remote Pilot in Command.

- There are a variety of existing and near-term technologies that provide situational awareness of traditional aircraft operations; there are few existing and near-term technologies that provide situational awareness of unmanned aircraft operations to pilots of traditional aircraft.

Technologies	Applicability	Widely Available?	In Development?	Cost to Develop	Cost to User
Remote ID					
Broadcast	UAS -> All	Soon	Yes	[blue] [green]	[purple]
Network	UAS -> All	No	Yes	[yellow] [orange] [red]	[purple] [blue] [green]
ADS-B					
Devices (In/Out/Both)	Piloted -> All	Yes	No	[green] [yellow] [red]	[purple] [blue] [green]
Network	Piloted -> All	Yes	No	[red]	[purple]
DAA					
Ground-Based & Network	Piloted -> UAS	No	Yes	[yellow] [gold] [red]	[purple] [blue] [green]
Onboard Aircraft	Piloted -> UAS	No	Yes	[yellow] [gold] [red]	[blue] [green] [yellow]
Strategic Deconfliction					
UTM	UAS->UAS	No	Yes	[gold] [red]	[purple] [blue] [green]
Sensor Network (not DAA)	All -> All	No	Yes	[yellow] [gold] [red]	[purple] [blue] [green]
Notifications (NOTAM)	UAS -> All	Yes	No	[green] [yellow]	[purple]

1 (purple)	**Up to and including $1,000**
2 (blue)	**> $1,000 but < $10,000**
3 (green)	**> $10,000 but < $100,000**
4 (yellow)	**> $100,000 but < $1,000,000**
5 (gold)	**>$1,000,000 but < $10,000,000**
6 (red)	**> $10,000,000**

- Relying on Remote ID information for situational awareness between UAS and piloted operations presents numerous challenges.



- Other solutions with potentially better detection range and coverage, may be a better tool for providing situational awareness to low altitude operators.
    - Providing useful and timely information in the cockpit of traditional aircraft remains a technology gap.

- There is also ongoing technology development of other solutions.
    - These involve a range of implementations, such as onboard or ground-based passive and active sensors. This development of these technologies has largely been driven by the responsibility placed on UAS as a new entrant in the National Airspace System (NAS) to yield the right of way to all piloted aircraft. As such, the significant cost of development and long-term use of these technologies is borne entirely by the UAS community. At this time, none of these are widely available.

DAC Tasking Group 9: Improving Low Altitude Situational Awareness For Manned and Unmanned Aircraft Subgroup 3

Presenters: Mark Colborn (DAC Member & Dallas PD) and Sam Ewen (Skyward)

Note: The Tasking Group 9 is aware and members are participating in Tasking Group 10 regarding Gender Neutral Language recommendations for the FAA and aviation community. We will use the term UAS Operator in this set of recommendations and will use agreed-to terms in the future. By "UAS Operator" we include the individual who is controlling the flight of the UAS, frequently called the Remote Pilot in Command.

- **Our recommendations span immediate to longer term**
- **Each recommendation was created to assist with the evolution of the UAS Traffic Management system**

Voluntary ADS-B In Use by UAS Operators	***Radio Use by UAS Operators***	***Voluntary Onboard Access for Low Altitude Aviators***	***Voluntary Notify & Fly***	***Ground Based Remote ID In Detection Network***

#1) Propose the FAA encourage UAS operators, developers and manufacturers to implement and use ADS-B In technologies.

- **Voluntary use**
- **Builds on UTM ConOps v2.0 scenario**
- **Primary stakeholders**: Both piloted aircraft and UAS operators
- **Considerations:**
  - Leverages an existing technology
- **Work required to make this a reality**
  - ADS-B technologies exist and are on the market today
  - FAA should encourage ADS-B equipage

#2) Propose the FAA considers amending AC 107-2A, Instructions on Radio Communications and How To Obtain a FCC Restricted Radio Telephone Operator's License.

- **Builds on UTM ConOps v2.0 Scenario**
- **Primary stakeholders**: Both piloted aircraft and UAS operators; radio monitoring and usage is of value for all airspace, controlled and uncontrolled
- **Considerations:**
  - UAS Operators do not meet the FCC requirements of Aircraft Station restriction:
  - 47 C.F.R, Part 87 defines Aviation Radio Services, including Aircraft Stations and Ground Stations
  - Leverage training available with the FAA's WINGS program (As a method of informing Part 61 Pilots about UAS Operations and Remote ID)

#3) Voluntary Onboard Access to Remote ID Information For Low Altitude Aviators

- **Propose the FAA develop an acceptance and/or certification path for voluntary adoption of low-cost onboard remote ID monitoring capability for manned aircraft.**
- **Builds on UTM ConOps v2.0,**
- **Primary stakeholder:** All aircraft pilots and UAS operators; additional stakeholders include all UTM participants, public safety, cities, airports and the general public
- **Considerations:**
    - Suggest the implementation might include current infrastructure and technology; EFB, NORSEE and be optionally TSO'ed
- **Work required to make this a reality**
    - FAA development of an acceptance and/or certification path for voluntary low cost onboard remote ID monitoring capability for manned aircraft
    - Industry production and sale of onboard remote ID receivers and software for aircraft pilots and owners
    - Leverage training available with WINGS program

#4) Propose the FAA Consider Notify & Fly As A Candidate for UPP 3 Validation.

- **Voluntary Use**
- **Builds on UTM ConOps v2.0 Scenario**
- **Primary stakeholders:** UAS operators as well as piloted aircraft
- **Considerations:**
  - UAS operator and aircraft pilot enters flight intent into app
  - Facilitates increased UAS communications for non-towered, uncontrolled airspace
  - Notify & Fly could be a first step to educating UAS communities on rigor of UTM
- **Work required to make this a reality**
  - Recommendation to FAA to evaluate how to scale LAANC-like features in uncontrolled airspace
  - Uncontrolled airports may be good locations for proofs of concept
  - Leverage training available with WINGS program (As a method of informing Part 61 Pilots about Notify and Fly)

#5) Ground Based Detection Network. Recommendation: Propose the FAA Explore Methods By Which Broadcast Remote ID Information Can Be Received By Ground Based Remote ID Receivers and Transmitted to UTM Systems and When Appropriate, To Manned Aircraft Via TIS-B Or Other Mechanisms.

- **Builds on UTM ConOps v2.0, Scenario**
- **Primary stakeholders:** Piloted aircraft and UTM participants, public safety, cities, airports and the general public
- **Considerations:**
  - Ground based first installations would be near airports & sensitive installations
  - Adds detection of VLOS operators
  - Appropriate filtering would be required for TIS-B
- **Work required to make this a reality**
  - Development of regulations and UTM industry standards for small UAS
  - Industry development of networked receivers and connection to UTM infrastructure
  - Installation of ground based networked receivers

Thank you for all the work!

- A great team with a broad and deep aviation background agreed on these recommendations.

- Academy of Model Aeronautics
- Air Line Pilots Association
- Aircraft Owners & Pilots Association
- Agriculture Aviation Organization
- Dallas Police Department
- DJI
- Drone Service Provider Alliance
- FPV Freedom Coalition
- Helicopter Association International
- Influential Drones, Inc.
- Kittyhawk
- Los Angeles Department of Transportation
- National Agricultural Aviation Association
- National Air Traffic Controllers Association
- Northeast UAS Airspace Integration Research Alliance
- Praxis Aerospace Concepts International, Inc.
- Robotic Skies
- Skyward
- University of Alaska Fairbanks
- Wing
- XiDrone Systems Inc.

Questions/Comments

Federal Aviation Administration

DRONE ADVISORY COMMITTEE

June 23, 2021

UAST

UNMANNED AIRCRAFT SAFETY TEAM

Unmanned Aircraft Safety Team (UAST) Briefing

UAST Co-Chair:

Peter F. Dumont

President and CEO, Air Traffic Control Association

UAST Mission and History

Chartered in 2016 by FAA Administrator Michael Huerta, the Unmanned Aircraft Safety Team (UAST) is an industry-government partnership committed to ensuring the safe operations of unmanned aircraft systems (UAS) in the national airspace system. The UAST supports the safe integration of UAS with data-driven safety enhancements and collaboration among members of the UAS industry.

UAST has adopted the same collaborative model as the General Aviation Joint Steering Committee (GAJSC) & Commercial Aviation Safety Team (CAST).

UAST
UNMANNED AIRCRAFT SAFETY TEAM

Current Member Organizations

(as of 5/26/2021)

AAAE	DHS	Northern Plains UAS Test Site
AeroVironment, Inc	DJI	NTSB
AIA	DoD	NUAIR Alliance
Airborne Public Safety Association	Drones by US	Pierce Aerospace
Airavat Solutions	EAA	Praxis Aerospace Concepts International
Airmap	EASA	PrecisionHawk
Airlines for America	FAA	Recreational Drone Pilot Testing
AlarisPro	Flight Safety	REIN
ALPA	Flirtey	Resilient Solutions
Academy of Model Aeronautics	Fresh Air Educators Inc.	Small UAV Coalition
American Airlines	GAMA	Technology Exploration Group
Amazon Prime Air	General Atomics	UAS Sidekick
American Tower	Genesis UAS Group	Uber
Aircraft Owners and Pilots Association	Helicopter Association International	Union Pacific
API	Insitu	University Aviation Association
Aria	International Association of Fire Chiefs	University of California
ASSURE	KittyHawk	University of Wisconsin
AT&T	MITRE	UPS Flight Forward
Air Traffic Control Association	NAAA	USCG
Assn. for Unmanned Vehicle Systems Intl.	NAMIC	USI
Bihrle Applied Research Inc.	NASA	Vantiage Robotics
Boeing	NATCA	Virginia Tech. Mid-Atlantic Aviation Partnership
CAPA	NATE	Volpe
Cognizant	NBAA	Walmart
Commercial Drone Alliance	NCDOT	Wing
Deloitte Consulting LLP	News Media Coalition	Yuneec USA
		Zipline

UAST Working Groups

- Data Analysis
- Safety Assurance
- Safety Mitigation
- Strategic Communication
- BVLOS (New!)

UAST
UNMANNED AIRCRAFT SAFETY TEAM

DRONE ADVISORY COMMITTEE
June 23, 2021

Data Analysis

- Areas and audiences
  - Recreational
  - Commercial
  - Advanced Operations
  - AAM
  - State/Local Agencies
  - General Public
- Leverage actionable data with purpose
  - Opportunities to educate
  - Opportunities to engage
  - Opportunities to empower

UAST
UNMANNED AIRCRAFT SAFETY TEAM

DRONE ADVISORY COMMITTEE
June 23, 2021

Safety Assurance - ASRS

Anyone involved in UAS Operations can file an ASRS report

- Recreational Flyers; Part 107, Part 135, Public Operators, Military
- Flight Crew, Visual Observers, Maintenance, Mission Planners, Safety Personnel and more

ASRS welcomes reports which describe close calls, hazards, violations, and safety related incidents such as:

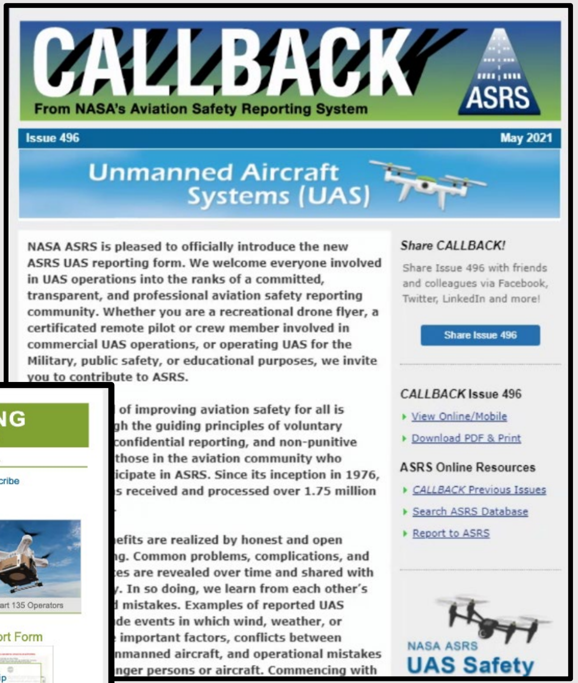
- Near Mid Air Collision
- Equipment Issues
- Lost Link / Fly Away
- Un/controlled Descent
- Airspace Incursions
- Environmental Hazards
- Miscommunication
- Procedural Issues
- Human Error / Mistakes
- Injuries

All reports are held in strict confidence and de-identified by NASA ASRS safety analysts. Reporter identity is never revealed. The resulting sanitized aviation safety data is shared with the aviation and UAS communities. When in doubt, fill it out! Contribute to aviation safety!

- NASA ASRS is a confidential, voluntary, non-punitive reporting system that receives safety reports from pilots, air traffic controllers, dispatchers, cabin crew, maintenance technicians, and now UAS Operators!

- FAA Advisory Circular has been updated to extend the protections of confidentiality and immunity to all involved in UAS Operations
  - **AC 00-46F was released on 4/2/2021**
    - FAA https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_00-46F.pdf

- **ASRS – UAS Report Form launched on April 15**
  - To submit a safety report via secure electronic submission go to: http://asrs.arc.nasa.gov, select "Report to ASRS"


CALLBACK
From NASA's Aviation Safety Reporting System
ASRS
Issue 496 May 2021
Unmanned Aircraft Systems (UAS)

NASA ASRS is pleased to officially introduce the new ASRS UAS reporting form. We welcome everyone involved in UAS operations into the ranks of a committed, transparent, and professional aviation safety reporting community. Whether you are a recreational drone flyer, a certificated remote pilot or crew member involved in commercial UAS operations, or operating UAS for the Military, public safety, or educational purposes, we invite you to contribute to ASRS.

of improving aviation safety for all is
gh the guiding principles of voluntary
confidential reporting, and non-punitive
those in the aviation community who
icipate in ASRS. Since its inception in 1976,
s received and processed over 1.75 million

efits are realized by honest and open
g. Common problems, complications, and
es are revealed over time and shared with
. In so doing, we learn from each other's
mistakes. Examples of reported UAS
de events in which wind, weather, or
important factors, conflicts between
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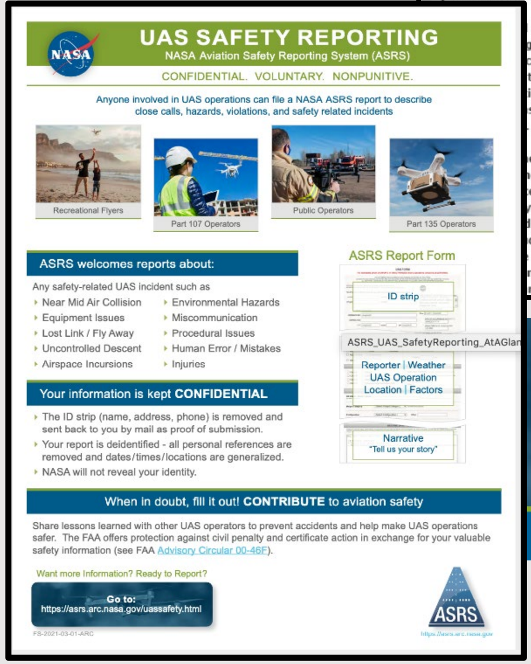
NASA ASRS
UAS Safety


UAS SAFETY REPORTING
NASA Aviation Safety Reporting System (ASRS)
CONFIDENTIAL. VOLUNTARY. NONPUNITIVE.

Anyone involved in UAS operations can file a NASA ASRS report to describe close calls, hazards, violations, and safety related incidents

Recreational Flyers | Part 107 Operators | Public Operators | Part 135 Operators

ASRS welcomes reports about:
Any safety-related UAS incident such as
- Near Mid Air Collision
- Equipment Issues
- Lost Link / Fly Away
- Uncontrolled Descent
- Airspace Incursions
- Environmental Hazards
- Miscommunication
- Procedural Issues
- Human Error / Mistakes
- Injuries

ASRS Report Form
ID strip
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Reporter | Weather
UAS Operation
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Narrative
"Tell us your story"

Your information is kept CONFIDENTIAL
- The ID strip (name, address, phone) is removed and sent back to you by mail as proof of submission.
- Your report is deidentified - all personal references are removed and dates/times/locations are generalized.
- NASA will not reveal your identity.

When in doubt, fill it out! CONTRIBUTE to aviation safety

Share lessons learned with other UAS operators to prevent accidents and help make UAS operations safer. The FAA offers protection against civil penalty and certificate action in exchange for your valuable safety information (see FAA Advisory Circular 00-46F).

Want more Information? Ready to Report?
Go to: https://asrs.arc.nasa.gov/uassafety.html
ASRS

UAST
UNMANNED AIRCRAFT SAFETY TEAM

UAST
UNMANNED AIRCRAFT SAFETY TEAM

DRONE ADVISORY COMMITTEE
June 23, 2021

Safety Mitigation

Focus Areas

- Develop education, outreach, and possible credentialing products
- Develop technology safety features to prevent unauthorized incursions/ excursions
- Develop consensus design standards for RTL implementation in UAS
- Provide education / outreach for RTL setup during mission planning & pre-flight

UAST
UNMANNED AIRCRAFT SAFETY TEAM

DRONE ADVISORY COMMITTEE
June 23, 2021

Strategic Communication

- Planning For Success Campaign
- UAST Website Redesign
- Tuesday Tweet Campaign
- Communications For UAST SE Documents
- DSAW - Sept. 2021
- Ongoing FAA Tasking Follow-up
    - Increase awareness about registration and re-registration requirements - May-June
    - Promoting The Recreational UAS Safety Test (TRUST) once it's out - Summer
    - Continued safety culture messaging

DRONE ADVISORY COMMITTEE
June 23, 2021

Beyond Visual Line of Sight

Proposal for a new working group to focus on future BVLOS operations

To cover all safety aspects of flight planning best practices, SMS, operations, NAS integration, incident preparedness & response, etc.

Focus on safety (not implementation, execution, or rule-making)

Independent Working Group

NATIONAL DRONE SAFETY AWARENESS WEEK

SEPT. 13–19, 2021

National Drone Safety Awareness Week educates the public about safe drone operations that engage recreational flyers, commercial pilots, public safety, and educators to spread awareness throughout the United States. The UAST leads the outreach and community engagement to promote safety and “drones for good” stories, technology advancements, successes, virtual events, and educational programs, as part of the FAA’s successful efforts, programs, and partnerships to safely integrate drones into our nation’s airspace.

Collaboration

- Industry
- Government (FAA, NAC, DAC, NASA, NTSB)
- International Entities
- Unions
- Associations
- Trade shows and events

Federal Aviation Administration

DRONE ADVISORY COMMITTEE

June 23, 2021

UAST

UNMANNED AIRCRAFT SAFETY TEAM

Questions or comments?

Peter F. Dumont

President and CEO, Air Traffic Control Association

pete.dumont@atca.org

703.299.2430

10 Minute Break

Task Group 10, Gender-Neutral Language for the Drone Community

Trish Gilbert
Executive Vice President
National Air Traffic Controllers Association

Mark Baker
President & CEO
Aircraft Owners and Pilots Association

DAC Tasking:
Gender-Neutral Language for the Drone Community

1. The DAC to develop recommendations for gender-neutral language as an alternative to gender specific terms currently used in the drone industry and aviation community.

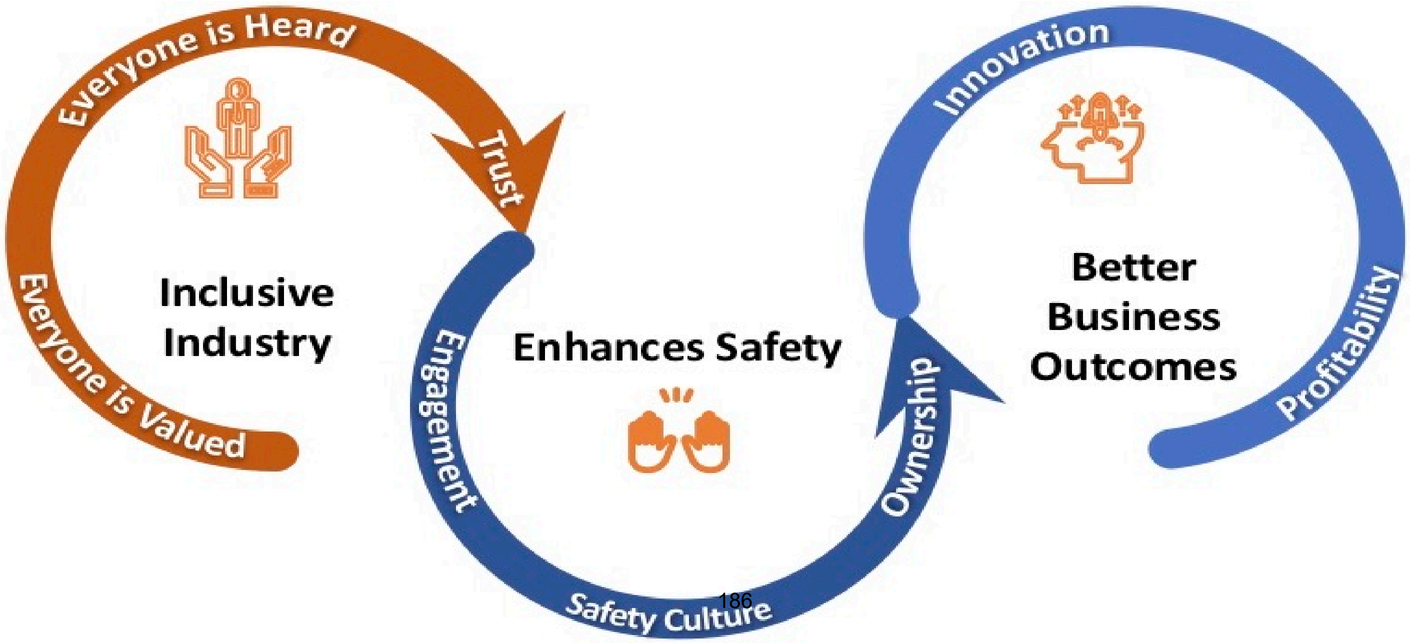
2. The DAC to take the lead to facilitate the adoption of gender-neutral language throughout the drone community and provide recommendations that organizations across the industry and community can implement.

Topics

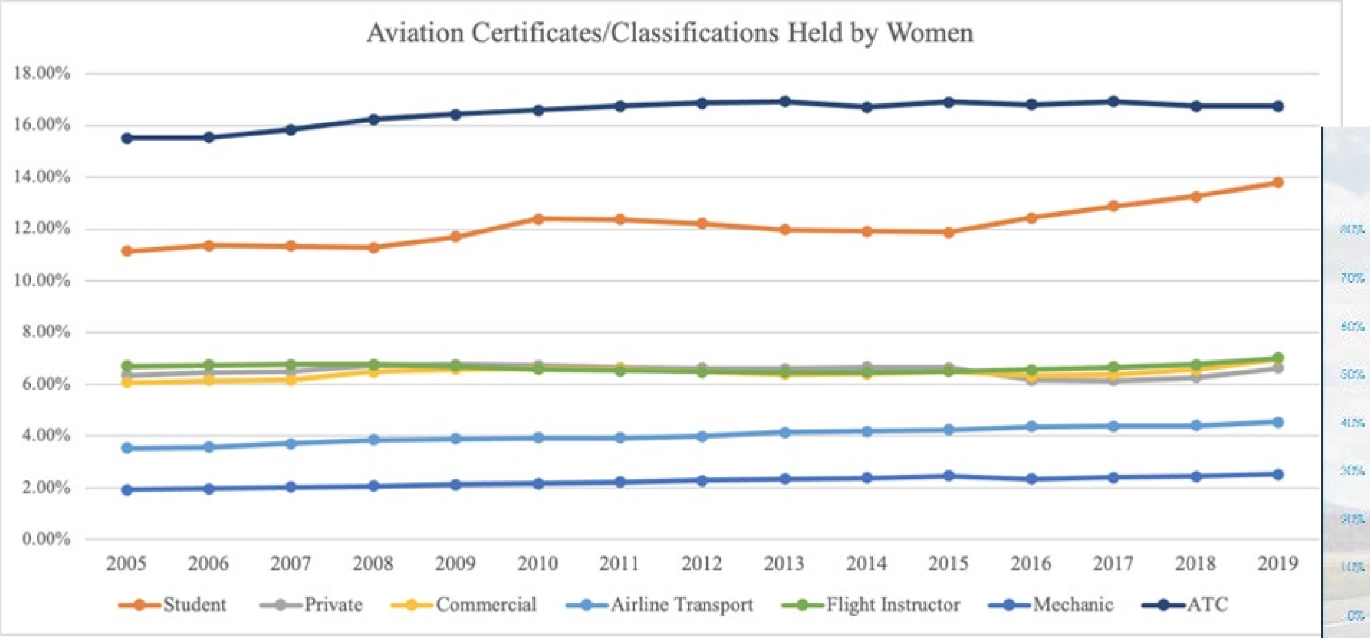
- Introduction
- Why gender-neutral language is important
- Style guide
- Final recommendation and close

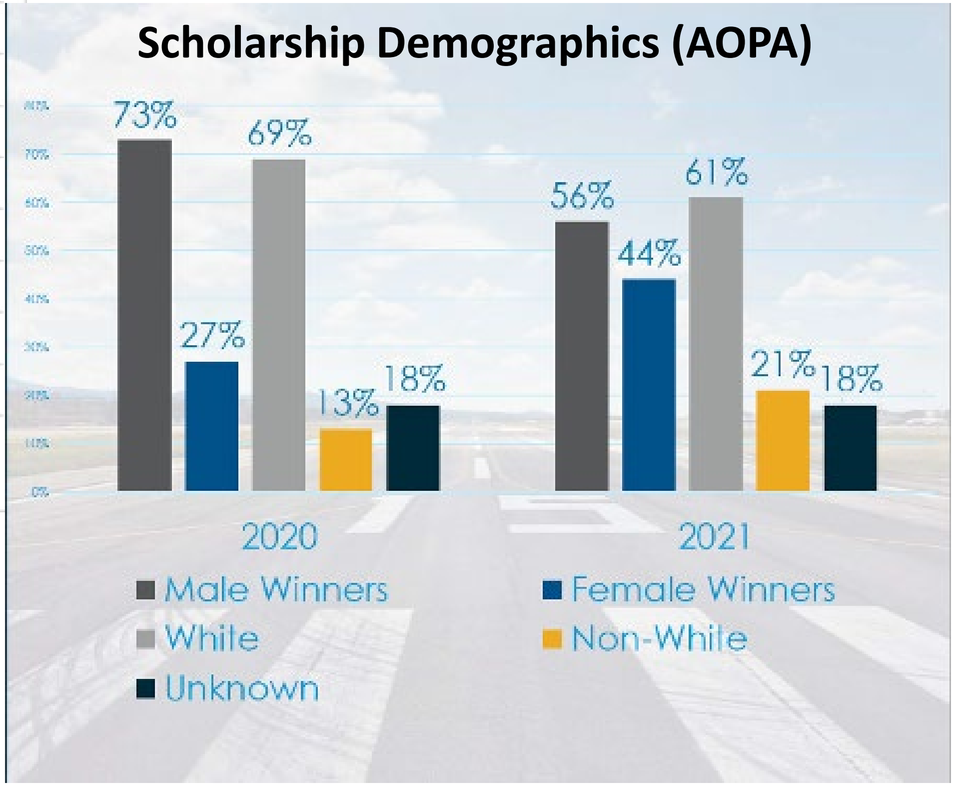
INCLUSIVE LEADERSHIP

Sustainable talent of the best and the brightest by deepening the pool



Why gender-neutral language is important

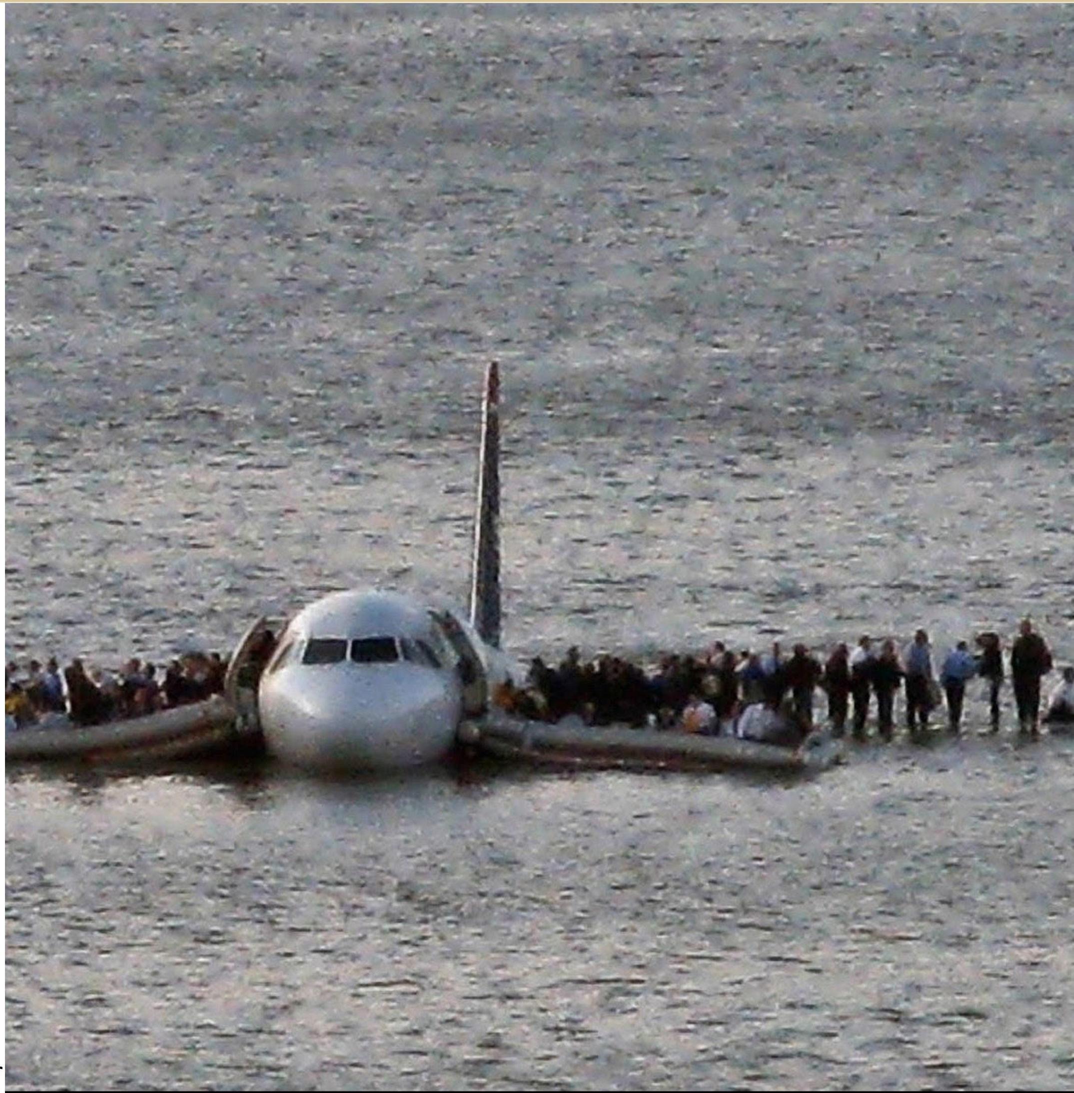




Safety Culture
DAC Tasking Group #8, Safety Culture

- Guiding principles, or tenets, that are considered common and foundational in strong safety cultures
  - Safety ownership
  - Safety modeled by leadership
  - Organizational values
  - Learning culture
  - Systemwide approach
  - Trust

Trust and Engagement enhances Safety



Source: Conde Nast Traveler

Top 10 benefits of workplace diversity

Source: TalentLyft

Recommendation #1 : Use Gender-Neutral Language whenever possible

The Federal Aviation Administration should adopt gender-neutral language in the drone industry. To ensure inclusion of all regardless of gender identity, and to avoid burdensome language, we recommend using gender-neutral language (e.g. “person”; “they”) rather than gender-binary (e.g. “man or woman”; “he or she”).

Style Guide

Difficulty in making the change
(based on whether an acceptable alternative already exists in FAA language)

Priority of making the change
(based on frequency in FAA use or explicit use of gender)

	Easier	*Harder*
Higher	Repairman → Technician	Airman/men → Aviator
Lower	Wife → Spouse	NOTAM → ?

Recommendation #2: Style Guide*

A. Retaining "***U***" in Unmanned, has advantages in retaining acronyms. ***Uncrewed*** should replace ***Unmanned; Drone*** is recommended as the optimal term

B. Replace repairman with **technician**

C. Consider replacing **airman/airmen** with **aviator(s)**

D. Retain **NOTAM** but as a word rather than as an acronym

E. Consider working with Congress on a revised definition of ***UAS***

*A complete list of recommended terms is contained in the report

Recommendation # 3: Where to apply

Transition to gender-neutral language should adopt these priorities:

A. All new documents, speeches, social media and marketing promotional material should use gender-neutral language.

B. Rework of existing documents and materials should be prioritized by the number of individuals exposed to the material, as well as the effort required to update the material.

Recommendation #4: Transform our communication

- Expand gender-neutral language beyond drone industry to all of aviation industry
- Encourage FAA, industry, pilots and operators to embrace the required change

Thank you to all the contributors

We had a diverse group, spanning manufacturers, associations, organizations, pilots and operators as well as gender, age and ethnicity. The team drew on the strength from other team members demonstrating the benefits of a diverse team where trust is paramount.

- **3DR**
- **Air Line Pilots Association**
- **Aircraft Owners & Pilots Association**
- **Alaska Center for UAS Integration**
- **Aero NowGen Solutions**
- **Boeing**
- **Dallas Police Department-UAS Squad**
- **DJI**
- **FPV Freedom Coalition**
- **Los Angeles World Airports**
- **National Air Traffic Controllers Association**
- **New York City Fire Department**
- **Robotic Skies**
- **Skyward**
- **Shell**
- **United Parcel Service**

Questions/Comments

FAA New Taskings to the DAC

Jay Merkle
Designated Federal Officer
Executive Director, UAS Integration Office

DAC Tasking: Acceptable Level of Risk for Unmanned Aircraft Operations Paper Review

Issue: Unmanned aircraft are being introduced into the national airspace system as the FAA evaluates proposals for waivers, exemptions, and develops new standards and regulations. However, unlike conventional aviation application, there are no established safety objectives for unmanned aircraft. Decisions relating to approving waivers or determining new regulations lack the underlying guidelines that are routinely applied to commercial and general aviation. This uncertainty contributes to a wide disparity in perspectives of acceptable risk.

Tasking: DAC members to provide comments and validate White Paper

Timeline: Responses due back to Secretariat 60 days after receipt of White Paper

DAC Tasking: Integrating UAS Operations Into K-12 Curriculums

Opportunity:

Leverage expanding interest in AAM and UAS into K-12 curriculums. Develop the next generation of innovative thinkers, leaders and operators. Encourages investments and continued education in STEM related fields.

Tasking: DAC to develop recommendations on how to integrate Advanced Air Mobility and Unmanned Aircraft Operations into K-12 curriculums.

Questions/Comments

Federal Aviation Administration

DRONE ADVISORY COMMITTEE

June 23, 2021

New Business/Future Agenda Topics

Houston Mills

Chair

FAA Drone Advisory Committee

Federal Aviation Administration

DRONE ADVISORY COMMITTEE

June 23, 2021

Closing Remarks

Jay Merkle

Designated Federal Officer

Executive Director, UAS Integration Office

Federal Aviation Administration

DRONE
ADVISORY
COMMITTEE

June 23, 2021

Adjourn

Houston Mills

Chair

FAA Drone Advisory Committee

AMENDED DAC CHARTER

Charter of the Drone Advisory Committee
U.S. Department of Transportation

1. **Committee's Official Designation.** The Committee's official designation is the Drone Advisory Committee (DAC).

2. **Authority.** The Committee is established under the authority of the U.S. Department of Transportation (DOT), in accordance with the provisions of the Federal Advisory Committee Act (FACA), as amended, Pub. L. 92-463, 5 U.S.C. App 2. The Secretary of Transportation has determined that the establishment of the Committee is in the public interest.

3. **Objectives and Scope of Activities.** The objective of the DAC is to provide independent advice and recommendations to the Department of Transportation (DOT) and the Federal Aviation Administration (FAA) and to respond to specific taskings received directly from the FAA. The advice, recommendations, and taskings relate to improving the efficiency and safety of integrating Unmanned Aircraft Systems (UAS) into the National Airspace System. In response to FAA requests, the DAC may provide the FAA and DOT with information that may be used for tactical and strategic planning purposes.

4. **Description of Duties.** The DAC will act solely in an advisory capacity and will not exercise program management responsibilities. Decisions directly affecting implementation of transportation policy will remain with the FAA Administrator and the Secretary of Transportation. The DAC will:

    a. Undertake only tasks assigned by the FAA

    b. Deliberate on and approve recommendations for assigned tasks in meetings that are open to the public.

    c. Respond to ad-hoc informational requests from DOT and the FAA and or provide input to DOT and the FAA on the overall DAC structure (including the structure of subcommittees and or task groups).

5. **Agency or Official to Whom the Committee Reports.** The DAC reports to the Secretary of the U.S. Department of Transportation (DOT) through the FAA Administrator.

6. **Support.** The FAA will provide support as consistent with the act, including funding for the Committee. The UAS Integration Office is the primary entity within the FAA responsible for supporting the DAC.

7. **Estimated Annual Operating Costs and Staff Years.** The FAA's annual operating costs to support the DAC for the period and scope specified by the charter is approximately

$460,000, which includes 2.0 full-time equivalent salary and benefits at $413,000, plus $47,000 for meeting, travel, and miscellaneous expenses.

8. **Designated Federal Officer.** The FAA Administrator, on behalf of the Secretary of Transportation, will appoint a full-time or permanent part-time Federal employee to serve as the DAC Designated Federal Officer (DFO). The DAC DFO will ensure that administrative support is provided for all activities. The DFO will:

    a. Ensure compliance with FACA and any other applicable laws and regulations.

    b. Call and attend all the committee and subcommittee meetings.

    c. Formulate and approve, in consultation with the Chair, all committee and subcommittee agendas.

    d. Notify all Committee members of the time, place, and agenda for any meeting.

    e. Maintain membership records.

    f. Ensure efficient operations, including maintaining itemized contractor invoices.

    g. Maintain all DAC records and files.

    h. Adjourn any meeting when doing so would be in the public interest.

    i. Chair meetings when directed to do so by the FAA Administrator.

9. **Estimated Number and Frequency of Meetings.**
    a. DAC estimates meeting three times a year to carry out its responsibilities. DAC meetings will be open to the public, except as provided under Section 10(d) of FACA, as implemented by 41 CFR part 102-3, and DOT Order 1120.3B.

10. **Duration.** Continuing, subject to renewal every 2 years.

11. **Termination.** The charter will terminate 2 years after its effective date, unless renewed in accordance with FACA and other applicable regulations. If the DAC is terminated, the FAA will give as much advance notice as possible of such action to all participants.

12. **Membership and Designation.** DAC shall comprise members appointed by the U.S. Secretary of Transportation upon recommendation by the FAA Administrator. All DAC members serve at the pleasure of the Secretary of Transportation.

a. The DAC will have no more than 35 members. Members represent airports and airport communities; pilot and controller labor groups; local, state, and tribal governments; navigation, communication, surveillance, and air traffic management capability providers; research, development, and academia; agricultural interests; traditional manned aviation operators; UAS hardware component manufacturers; UAS manufacturers; corporate UAS operators; citizen UAS Operators; UAS software application manufacturers; advanced air mobility and industry associations or other specific areas of interest as determined by the DAC DFO.

b. Members will serve without charge, and without government compensation. Members who represent a particular interest of employment, education, experience, or affiliation with a specific aviation related organization will serve as representatives. Members appointed solely for their expertise serve as Special Government Employees.

c. Member representatives and SGEs are appointed for a 2-year term, but can continue to serve until their replacement is chosen or they are reappointed

13. **Subcommittees.** The FAA Administrator has the authority to create and dissolve subcommittees as needed. Subcommittees must not work independently of the DAC. They must provide recommendations and advice to the DAC, not the FAA, for deliberation, discussion, and approval.

14. **Recordkeeping.** The records of the DAC are handled in accordance with the National Archives and Records Administration (NARA) General Records Schedule 6.2, or other approved agency records disposition schedules. Subject to the Freedom of Information Act, 5 U.S.C. § 552, the records, reports, transcripts, minutes, and other documents that are made available to, or prepared for or by DAC will be available for public inspection at https://www.faa.gov/uas/programs_partnerships/drone_advisory_committee/.

15. **Filing Date.** This charter is effective June 12, 2020, and will expire 2 years from that date on June 12, 2022. The amended charter is effective January 13, 2021

Advisory Committee Member Roles and Responsibilities

Advisory committees have played an important role in shaping programs and policies of the federal government from the earliest days of the United States of America. Since President George Washington sought the advice of such a committee during the Whiskey Rebellion of 1794, the contributions made by these groups have been impressive and diverse.

Through enactment of the Federal Advisory Committee Act (FACA) of 1972 (Public Law 92-463), the U.S. Congress formally recognized the merits of seeking the advice and assistance of our nation's citizens to the executive branch of government. At the same time, the Congress also sought to assure that advisory committees:

- Provide advice that is relevant, objective, and open to the public;
- Act promptly to complete their work;
- Comply with reasonable cost controls and recordkeeping requirements; and
- Had government oversight through creation of the Committee Management Secretariat.

Participation in a FACA such as the Drone Advisory Committee (DAC) provides the Federal Government with essential advice from subject matter experts and a variety of stakeholders. The FACA requires that committee memberships be "fairly balanced in terms of the points of view represented and the functions to be performed." Selection of committee members is made based on the particular committee's requirements and the potential member's background and qualifications. DAC members assume the following responsibilities:

- Attend ¾ of all DAC public meetings during membership term.
- Provide oversight, deliberation, comments and approval of the DAC activities.
- Contribute respective knowledge and expertise.
- Participate as a member on a working group, if desired.
- Coordinate with the constituents in his or her Unmanned Aircraft System and aviation sector.
- Review work plans, if requested.
- Review the DAC and any subcommittee or working group recommendation reports.
- Inform the DAC Chair and the DFO when he or she can no longer represent his or her organization/association on the DAC.
    - Members may continue to serve until a replacement has been appointed or removed.

Federal Aviation Administration

Jay Merkle

Executive Director, Unmanned Aircraft Systems Integration Office

Prior to being named the new Executive Director of the Unmanned Aircraft Systems Integration Office, Peter “Jay” Merkle was the Deputy Vice President (DVP) of the Program Management Organization (PMO) within the Air Traffic Organization (ATO). The PMO is responsible for all NextGen program activity; all National Airspace System (NAS) communications; navigation, weather, surveillance and automation modernization programs; and all service life extensions to legacy NAS sensors, communications and navigation aids. Given the tight coupling between successful automation program delivery and current system operation, the PMO also leads and manages all second-level automation engineering efforts. Lastly, the PMO works with FAA operations and aviation users to ensure globally interoperable solutions for NextGen.

Prior to that position, Merkle was the Director of Program Control and Integration, AJM-1, in the PMO for the ATO. In that capacity, he led the PMO in developing effective, timely, and innovative solutions to evolving business needs. The focus areas were program control, crosscutting analysis and integration, and special initiatives.

Since joining the FAA, Merkle has served as the Manager of Systems Integration for Portfolio Management and Technology Development within the NextGen organization. He also has held positions as the Lead Engineer for tower, terminal, and en route automation systems, as the Chief System Engineer for En Route and Terminal Domains, and as the Chief Architect for NextGen at the Joint Planning and Development Office.

Merkle has over 30 years of extensive experience in engineering and program management. He started his career as an engineer working in cockpit and crew station design on several aircraft, including the C-17 large transport aircraft. Merkle holds a Bachelor’s degree in Psychology from the University of Central Florida and a Master's degree in Industrial Engineering and Operations Research from the Virginia Polytechnic Institute and State University.

Captain Houston Mills

UPS Vice President Flight Operations & Safety,

As Vice President of Flight Operations & Safety, Captain Mills has global oversight of and responsibility for UPS Airline Flight Operations, Training, Regulatory Compliance and Airline Safety.

Prior to his current position Houston served as Global Aviation Strategy & Public Policy Director, where he advocated for federal and international aviation policy and collaborated with domestic and international industry groups to harmonize aviation safety standards and sustainability rules. He was also responsible for aggregating aviation strategy issues under one umbrella within UPS to help maximize safety and reliability for the company, as well as service to UPS's growing global customer base.

Houston also served as UPS's Director of Airline Safety and Compliance where he was responsible for ensuring safe and regulatory compliant Flight, Maintenance, and Ground support operations, Emergency Response preparedness, and interaction with government regulatory and safety organizations worldwide. Under his leadership UPS became one of the first U.S. airlines to have a certified Safety Management System (SMS). He also served as the UPS International Chief Pilot, where he was responsible for crew-related international flight operation activity and as the Director of Flight Training where he was responsible for the UPS Advance Qualification Program (AQP) for all crewmembers.

Houston currently serves as one of 35 executives on the newly formed FAA Drone Advisory Committee, where he brings an airline and pilot perspective to a group of other transportation and technology leaders as they explore policy considerations for unmanned aerial systems (UAS) integration into the National Air Space system. He also serves as the Chairman of the Cargo Airline Association Board of Directors, and member of the International Air Transport Association (IATA) Safety Flight Ground Operations Advisory Council, and the Airlines for America (A4A) Safety and Operations Councils.

A native of Indianapolis, Houston received a bachelor's in English literature from Wabash College and an MBA from Webster University. He also holds a Professional Human Resources designation.

Houston began his aviation career in 1985 as a Marine Corps officer and F/A-18 fighter pilot where he was certified as an air combat tactics instructor (ACTI). He served the United States in Operations Desert Shield, Desert Storm, Restore Hope and Southern Watch. He has more than 100 aircraft carrier landings to his credit. He has previously served as an FAA designated check airman and is currently an international qualified Captain on the Boeing 757/767.

In step with UPS's commitment to the community, Houston serves on the national Board of Directors of the Marine Toys for Tots Foundation, Association for Unmanned Vehicles Systems International (AUVSI), Aero Club of Washington Board of Governors, and is president of the Marine Corps Coordinating Council of Kentucky.

Married and the father of three, Houston particularly enjoys motivational speaking, golf, and has coached various youth sports for many years.

Drone Advisory Committee

February 24, 2021 • Virtual Meeting

Detailed Minutes

Introduction
The Drone Advisory Committee (DAC) was held on February 24, 2021, from 12:00 PM to 2:00 PM EST. This meeting was held virtually and livestreamed because of the COVID-19 emergency.

Designated Federal Officer Opening Remarks

Mr. Jay Merkle started the meeting by welcoming the audience and reading the Designated Federal Officer (DFO) opening statement. After reading the opening statement, Mr. Merkle turned the meeting over to the Acting Deputy Administrator, Mr. Bradley Mims. Mr. Mims expressed his thanks to the DAC members for their hard work. He shared that the work of the DAC is directly transitioning into the FAA's effort to keep the National Airspace (NAS) safe. Mr. Mims highlighted the different manners in which UAS technology is being used by the public. He shared that the future of UAS technology is ever evolving and the DAC is an important component in that process. After finishing his remarks, Mr. Mims turned the meeting back over to the DFO. Mr. Merkle then discussed the agenda for the meeting. Lastly, Mr. Merkle asked for a motion for approval of the October 2020 meeting minutes. There were no objections and the motion passed.

After concluding the housekeeping items, Mr. Merkle began his opening remarks. Mr. Merkle thanked the members of the DAC for their hard work on the various Task Groups during the Covid-19 emergency. He highlighted significant achievements that have taken place since the last meeting such as the publication of final rules on Remote Identification and Operations Over People. He also shared that the FAA announced they are seeking partners for "The Recreational UAS Safety Test" (TRUST). Additionally, he provided an update that plans are underway for the 2021 FAA UAS Symposium and other high-level events. Mr. Merkle shared that he looks forward to working with the new administration and the DAC on future agenda topics. He then turned the meeting over to the DAC Chair.

View the DFO's remarks (link is timestamped for DFO Opening Remarks):
https://youtu.be/73K6TrkVGKE?t=3

DAC Chair Opening Remarks

DAC Chairman, Michael Chasen, began his remarks by thanking everyone for attending the virtual DAC meeting. He congratulated the new DAC members on being selected and he highlighted the new stakeholder groups to the DAC. Mr. Chasen shared that this would be his last meeting. He was proud of the work he had been a part of during his time on the DAC. He thanked the DAC members for their hard work on various taskings during his tenure and thanked the FAA for their support while he served as DAC Chair. After his opening remarks, Mr. Chasen turned the meeting over to Task Group 6 for their presentation.

View the DAC Chair's remarks: (link is timestamped for DAC Chairman Opening Remarks): https://youtu.be/73K6TrkVGKE?t=827

Task Group #6: BVLOS

Presenters:
Mike Romanowski, Director, Policy & Innovation, Aircraft Certification Service
Bruce DeCleene, Director, Office of Safety Standards, Flight Standards

Mr. Romanowski shared that the DAC provided 21 recommendations to the FAA on the BVLOS tasking. To properly address the recommendations, Mr. Romanowski included Bruce DeCleene in the presentation, as the recommendations applied both to Aircraft Certification and Flight Standards Service. The 21 recommendations were categorized into four major areas including: UAV Certification, Detect and Avoid, Autonomy, and Command/Control & Spectrum.

The DAC eBook provides the official FAA response on Task Group 6 recommendations.

Following the presentation, there was a DAC Task Group #6 Discussion.

View this presentation and discussion (link is timestamped for Task Group 6: BVLOS presentation):
https://youtu.be/73K6TrkVGKE?t=1010

DAC Task Group #8 – Safety Culture

Presenters:
Bruce DeCleene, Director, Office of Safety Standards, Flight Standards
Mike Romanowski, Director, Policy & Innovation, Aircraft Certification Service

Mr. Bruce DeCleene lead the presentation on FAA responses to Task Group 8. Mr. DeCleene shared that the Task Group identified five common safety culture tenets: safety ownership, organizational values, learning culture, system wide approach, and trust. These five tenets were divided into four work groups, which represented communities of interest. The four work groups include: manned aircraft community, recreational and community based organizations, small commercial operators, and national operators. The FAA observed that the five tenets overlapped with the different work groups, and realized that each work group will need to be targeted via different methods. The FAA agreed with all the recommendations that the DAC provided and would like to work with industry to implement the recommendations. The DAC eBook provides the official FAA response on Task Group 8 recommendations.

Following the presentation, there was a DAC Task Group #8 Discussion.

View this presentation and discussion (link is timestamped for DAC Task Group #8 – Safety Culture): https://youtu.be/_2E_eWhE8hE?t=208

DAC Task Group #9 – Low Altitude Remote Identification Operations Update

Lead: James Burgess
Presenter: Matthew Satterley

The DAC Chair called upon James Burgess to present on Task Group 9, Low Altitude Remote Identification (RID) Operations. Mr. Burgess shared that Matthew Satterley would present the update on Task Group 9. Mr. Satterley shared that Task Group 9 started working on the tasking in December. He shared that the group approached the problem by dissecting the problem statement. After dissecting the problem statement, the group created three sub-groups. The sub-groups are:

1. follow the direction set by the FAA,
2. explore the spirit of the problem, and
3. look at what else the group needs to know or investigate.

Each sub-group is being led by different members and each group is analyzing the best method to solve the question. The Task Group hopes to provide recommendations to the FAA by the June 2021 meeting. The DAC eBook provides the official Task Group 9 update presentation slides.

Following the presentation, there was a short Task Group 9 Update Discussion.

View the presentation and discussion (link is timestamped for Task Group 9 Update: https://youtu.be/_2E_eWhE8hE?t=1686

DAC Operations and Technology Subcommittee Update

Presenter:
Captain Houston Mills

Captain Houston Mills presented on the DAC Operations and Technology (O & T) Subcommittee Update. Capt. Mills shared that all DAC members are automatically part of the subcommittee and that non-DAC members who would like to join the subcommittee will need to be submit a resume and bio. All non-DAC members will also need to be vetted by Office of the Secretary of Transportation. Capt. Mills shared that as of the meeting, 21 non-DAC members have applied to join the subcommittee.

There was no discussion following the presentation.

View the presentation (link is timestamped for DAC (O & T) Subcommittee Update): https://youtu.be/_2E_eWhE8hE?t=2694

New DAC Tasking – Gender Neutral Language

Presenter:
Jay Merkle, Executive Director, UAS Integration Office

Mr. Merkle, shared that the FAA is issuing a new tasking for the DAC. Mr. Merkle highlighted that the FAA is focused on promoting diversity and inclusion in the drone community. Aviation typically uses gender specific terms. There is a growing awareness of how language facilities inclusion and creates a diverse environment. The FAA is interested in encouraging the use of gender neutral language in day-to-day language within the drone community. Mr. Merkle highlighted that there is recent trends on this topic with Congress adopting gender neutral language, businesses adopting the same measures, and international organizations also adopting this approach.

The tasking from the FAA requests that the DAC develop recommendations for gender neutral language as alternative to gender specific terms. The FAA also requests that the DAC take the lead to facilitate the adoption of gender neutral language throughout the drone community and provide recommendations that organizations across the industry and community can implement. The DAC eBook provides the official New DAC Tasking presentation slides.

Following the presentation, there was a short discussion of this new tasking.

After the conclusion of discussion, the DAC Chairman asked for a motion to approve the new tasking and assigning it to the standing subcommittee. The motion was approved; there were no objections.

View the presentation and discussion (link is timestamped for New DAC Tasking): https://youtu.be/_2E_eWhE8hE?t=2902

New Business/Agenda Topics

The Chairman opened the floor to DAC members to bring up any new business topics or agenda topics. Dr. Jaiwon Shin, Mr. Kenji Sugahara, Mr. Jaz Banga, Ms. Seleta Reynolds, Capt. Houston Mills, and Mr. Bob Brock, presented new business items and agenda topics.

View the discussion (New Business/Agenda Topics):
https://youtu.be/_2E_eWhE8hE?t=3633

Closing Remarks and Adjourn

Mr. Merkle began his closing remarks by thanking all those who help make the DAC possible, welcoming the new DAC appointees, and thanking Mr. Chasen for his time as DAC Chair. Mr. Merkle shared that Mr. Chasen was the right person for the job and he brought with him the energy that the DAC needed. He then turned the floor over to the DAC Chair.

Mr. Chasen thanked the FAA and the DAC members for their effort in making this meeting happen. Mr. Chasen shared he was proud of the work that the DAC has done and wished everyone continued success.

After concluding his remarks, the Chairman asked for a motion to adjourn the meeting. The motion was approved and the meeting was adjourned.

View the closing remarks (Closing Remarks and Adjourn):
https://youtu.be/_2E_eWhE8hE?t=4172

Appendix A: FAA Meeting Attendees

Name	Title	Org.
1. Jay Merkle	Executive Director, UAS Integration Office	FAA
2. Bradley Mims	Deputy Administrator	FAA
3. Angela Stubblefield	Chief of Staff	FAA
4. Laurence Wildgoose	Assistant Administrator, Office of Policy, International Affairs and Environment	FAA
5. Ali Bahrami	Associate Administrator, Aviation Safety	FAA
6. Teri Bristol	Chief Operating Officer, Air Traffic Organization	FAA
7. Timothy Arel	Deputy Chief Operating Officer, Air Traffic Organization	FAA
8. Mark Bury	Acting Chief Counsel, Office of General Counsel	FAA
9. Winsome Lenfert	Acting Associate Administrator, Airports	FAA
10. Claudio Manno	Associate Administrator for Security and Hazardous Materials Safety	FAA
11. Tonya Coultas	Deputy Associate Administrator, Security and Hazardous Materials Safety	FAA
12. Jeannie Shiffer	Acting Assistant Administrator, Office of Communications	FAA
13. Mike Romanowski	Director, Policy and Innovation Division	FAA
14. Bruce DeCleene	Director, Office of Safety Standards	FAA
15. Bill Crozier	Deputy Executive Director, UAS Integration Office	FAA
16. Gary Kolb	UAS Stakeholder & Committee Officer, UAS Integration Office	FAA

Confirmed FAA/DOT Observers		
Name	**Title**	**Org.**
1. Erik Amend	Manager, Executive Office, UAS Integration Office	FAA
2. Leesa Papier	Director, Office National Security Programs and Incident Response	FAA
3. Adrienne Vanek	Director, International Division, UAS Integration Office	FAA
4. Joe Morra	Director, Safety and Integration Division	FAA
5. Katherine Inman	Senior Attorney, Office of General Counsel	FAA
6. Elizabeth Forro	Special Assistant, UAS Integration Office	FAA
7. Marcus Cunningham	UAS Liaison, Aviation Safety Standards	FAA
8. Allison LePage	Digital Communications Manager, Office of Communications	FAA
9. Jessica Orquina	Lead Communications Specialist, UAS Integration Office	FAA
10. Khurram Abbas	Communications Specialist, UAS Integration Office	FAA
11. Jennifer Riding	Program Analyst, UAS Integration Office	FAA
12. Kristen Alsop	Digital Communications Strategist	FAA

Written Public Comments Submitted Since Last DAC Meeting

This email was sent through the Federal Aviation Administration's public website. You have been contacted via an email link on the following page:
https://www.faa.gov/uas/programs_partnerships/drone_advisory_committee/

Message
To who it may concern, I learned today that the drone advisory committee is putting time and efforts into identifying language that may not be considered gender neutral or may discourage people from seeking aviation careers. Truthfully, as a drone operator and UAS business owner for the last 6 years I am disappointed to hear that there is so much effort being put into something other than safety, technological advances, and education. We are all seeing the never ending arguments over meanings of words and it is getting a bit over the top. In this case, removing the term "airman" or "unmanned" from published literature from the FAA seems pretty unproductive when these terms are derivative of the word "human," as in humankind and not "man." This isn’t related to male or female and wasn’t ever intended to be. I'm certain the vast majority of anyone reading FAR's doesn’t believe that a specific gender is discounted. I can understand politicians bickering over such things but I know there are far more pressing regulatory items where efforts can be placed. Members of this committee have been chosen to represent multiple facets of the industry and I am truly surprised that this is even an issue. I can honestly say all of the other operators I know and have spoken to agree that this is a waste of time and feel like a fruitless attempt at political correctness. I do thank the advisory committee for their hard work on drone rules and regulations and I hope that effort continues. Thank you for your time.